GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

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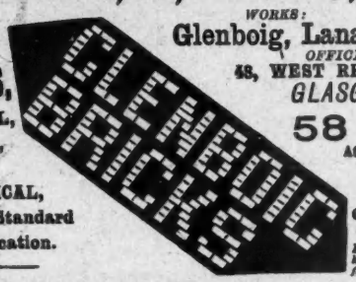

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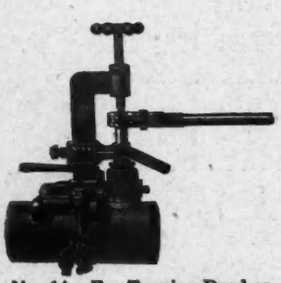

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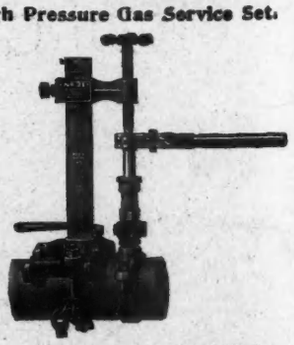

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLI., No. 2856.] TUESDAY, FEBRUARY 5, 1918. [70TH YEAR.

EDITORIAL NOTES.

Revised Schedule of Protected Occupations. All Gas Undertakings Included.

IN the "JOURNAL" last week [p. 200] attention was directed to the issue of a revised Schedule of Protected Occupations, which came into operation on the 1st inst. The imperative needs of the Army have compelled the revision; and this fact must be kept well in mind by all in considering the extent to which the modifications affect them. When the former schedule came into operation on May 7 last year, it was explicitly stated that it would be subject to revision from time to time; and this also applies to the present one. Experience under the former schedule, and of fresh places in which dilution has proved feasible and successful, has suggested to the authorities where there can be amendment. So far as gas undertakings are concerned, it will be seen from the information given on p. 237 that there are very important changes to which gas engineers must pay serious heed, for they may affect a good many who are in the position to carry dilution to a further extent than has already been done by them.

Under chemicals and explosives manufacture, general protection is continued for the various men engaged in manufacturing processes, where the materials are required directly or indirectly for Admiralty, War Office, or munitions work. In several other sections—such as those referring to coke-oven plant, engineering, and professional occupations—readers of the "JOURNAL" will be interested; but here we will only specifically refer to the changes that have been made in connection with gas-works. An alteration which will be appreciated is that all gas undertakings have been brought within the scope and under the operation of the revised schedule by the omission of the words: "In cases "where the undertakings are certified by the Ministry of "Munitions under the Munitions of War Act." Thus all gas-works, whether or not certified, are now protected within the limits defined by the schedule. The next thing noticed is that the age limit of foremen, assistant foremen, and crab crane drivers has been raised from 23 to 25. The word "chief" has been deleted before "valve man or governor "house man." "Charging machine driver; repairer" has been altered to "charging or discharging machine driver-repairer (skilled)." The importance of the substitution of a hyphen for a semi-colon will be recognized. The driver-repairer, it seems, must be a self-contained person; and with the word "skilled" following, it may be inferred that the capacity for repairing will be regarded as more important than driving in making claim to protection, if a man is of military age and fitness. Before "Gas stokers" "(*a*)" has been added; and in parenthesis we have the following explanation as to who is included in the term: "*i.e.* men "engaged in operations of charging and discharging by "hand horizontal or inclined retorts in which coal is car-"bonized; lid men in retort-houses with stoking machines; "top and bottom men on vertical retorts; and hot-coke "wheelers in subways." The change from driver to driver-repairer and the deliberate reference to hand work in the definition of "gas stoker" are significant; and the women retort-house operatives at Vauxhall at once come to mind. "Fireman, clinkerman, pipe jumper, pipe trier, plugger-up, "poker-in, scaler, and scurfer" were not previously scheduled. They are now; and the age limit is put at 32. The age limit (23) of "gas maker" under carburetted water gas has not been altered; but no mention is made of water gas that is not carburetted, though the Coal Controller wants as much uncarburetted water gas as possible produced, and the Petroleum Department as little oil as possible used.

As to the outdoor department, "gas-fitter (skilled)" now appears in place of "gas-fitter or plumber;" so the industry will have to do without plumbers if of military age and fitness, and rely entirely upon skilled gas-fitters to do any plumbing work. There is no change in "Main layer, joiner, or service layer (skilled);" but they are now allowed mates of 36 years and over. Supervising meter repairer mechanics (skilled), and valve men and district syphon men are now scheduled, with an age limit in all cases of 32.

Under professional occupations, the age limit of works, analytical, or research chemists has been raised from 19 to 23 years, and "professional" has been added to "mechani-"cal engineer" and "electrical engineer." Now scheduled, too, are timekeepers in works with 1000 employees or over, and storekeeper (works' general stores and engineering works' tool stores) in works having 250 employees or more. In both cases, the age limit is 28 years.

From this indication of the changes that principally affect gas undertakings, it will be seen that the authorities have both made concessions and increased their power for removing additional men. Of this we are quite satisfied, that those who heed the warning given in our last two issues, as to making use of the spring and summer as a training time for an extension of dilution will next winter find that they have acted wisely.

A Frank Statement.

IN the two opening paragraphs of their half-yearly report, the Chairman (Mr. Charles Carpenter, D.Sc.) and Directors of the South Metropolitan Gas Company lay bare, with perfect frankness, the unsatisfactory financial results of the last half-year's working; but proprietors must not confuse this with the intrinsic solidity of the Company's position as a trading concern. We are passing through a period when abnormal conditions continue to inflate; and they have done so to such an extent that those that had become familiar but a few months ago are of the past, and far worse have succeeded. Much greater difficulty and higher expense have come upon the Company, as upon other gas undertakings; and the keenest prevision could not have warded them off. They were quite unexpected. The methods of the Government in settling labour disputes or difficulties take little or no count of ulterior mischievous effects. The only desire of the Government is to rid themselves of immediate trouble. The result is that the best calculated estimates of industrial concerns—and this has been more particularly so in the case of gas undertakings—have been, by but a single Government act, ruthlessly upset, and are irreparable. In this case, the Directors raised the price of gas to 3s. 1d. last Midsummer; but they did not foresee, and they could not do so, that the Government would be raising the wages of the miners, and would give the colliery owners the right to a retrospective advance of 2s. 6d. per ton upon coals under contract, nor could they anticipate the general movement towards an increased war bonus for employees. Underlying some passages in the report, there appears to be a touch of resentment; but the words themselves convey, very concisely and cogently, the truth of the whole position. "The "financial control of the undertaking," it is remarked, "has for all practical purposes passed from the hands of "the Board to those of the Government, who settle the "prices of residual products as well as of raw materials, "and fix scales of wages which, possibly justifiable in the "floodtide of prosperity, appear out of place when asso-"ciated with the critical period through which the country is "passing." In this, not a word too many or too little

appears. The statement can be adopted by all gas undertakings in the country; and, combined with the indispensable work of varied character that the industry is rendering to the nation and to every individual community, there is in the quoted remarks a complete case for gas undertakings receiving from the Government more consideration than they have done in the past.

But as to the effect of unpremeditated circumstances upon the Company. On the past half year, after providing for the debenture interest and other charges, there is—despite the increase in the price of gas from 2s. 8d. to 3s. 1d. at Midsummer—only a surplus of £80,103; and to pay under the sliding-scale the low dividend at the rate of 4 p.ct. per annum, it will be necessary to draw upon the reserve fund to the extent of £56,261. Fortunately the Company have £199,000 in the fund; so that a respectable balance will still remain there. The actual profits for the half year, however, only provide sufficient for a return of £2 7s. p.ct. The amount that has to be drawn from the reserve fund is almost equalled by the £32,000 by which the charges for coal were increased above the contract prices by the beforementioned action of the Government, and by an addition of £20,000 to labour charges beyond the sum estimated. The figures show that the estimates of the Board were at the time well-founded within the limits of their then knowledge as to conditions. They are also striking, especially those indicating the actual dividend earned during the half year; and no Parliamentary Committee could, with reason and justice, refuse the Company the modest measure of financial relief for the proprietors that is being sought. Asking for the raising of the standard price from 3s. 1d. to 3s. 7d. will, at the current price of gas (3s. 7d.), only yield the proprietors 4 p.ct., which is little enough in these times of heavy personal obligation. We are afraid there will be proprietors who will, when they see this figure, question whether the Board have gone far enough; for with 3s. 7d. the current charge for gas, and no prospect of expenses being lessened during the war, there is nothing at all in the Directors' proposals in the nature of a protecting margin to the 4 p.ct. Who can say that a still further increase will not be necessitated? Six months ago, the Chairman, with all his knowledge of gas affairs, did not anticipate that this January would see a price of 3s. 7d. ruling in South London. Moreover, the report itself makes the significant admission: "Nor does the further increase to the current rate of 3s. 7d. "allow any margin of working."

Glancing now over the accounts, it is seen that coal has cost no less than £920,712, or £208,716 more than in the corresponding half of 1916. This considerable increase includes only an additional 45,681 tons of coal—the quantity carbonized having been 604,786 tons. From this quantity 7,450,061,000 c.ft. of gas were made, or 606,392,000 c.ft. more than in the second half of the previous year. The make of gas per ton was not quite so good as in the June half of the year, but better than in the corresponding period of 1916. It was 12,318 c.ft.; while in the June six months it was 12,498 c.ft., and in the comparative period 12,240 c.ft. But many things interfere with make in these times—an important one being the depreciated quality of coal, while the pressure under which work has to be done owing to the increased demand for gas, and the extraordinary conditions of labour, are also circumstances that have no doubt had a part in producing the small average reduction of make per ton, compared with the preceding six months. Again, the secondary products did not do anything to relieve the increased cost of coal. Producing £527,215, they made the net cost of coal £393,497; while in the corresponding half year, yielding the sum of £536,912, they made the net cost £175,084. The net cost therefore was more by £218,413, which is a very serious figure with only (as was previously remarked) 45,681 tons more coal carbonized. From the sums quoted, it will be gathered that the secondary products in the aggregate produced £9697 less—the falling-off taking place in ammonia and products to the extent of £16,624, and in tar products to the amount of £727, with additional credits from coke of £6390, and from breeze of £1264. Considering the bulky character of the Company's business, the figures are remarkable for the coincidence they disclose in the receipts for secondary products with those for the corresponding months of 1916. Following on with the manufacturing charges, purification is up by £8981, due probably to increased wages and the extra impurity to be dealt with owing to the condition of the coal. Carbonizing wages show an advance of £26,299. An increase of £64,343 is seen in repairs and maintenance of works. The total of the manufacturing expenses is £1,232,495—an increase of £306,789. There are no other items of expenditure to which attention need be drawn. But an interesting fact is that, distinct from salaries, wages claimed £502,626 of the income of the half year, or £160,832 more. This increase we surmise includes war bonus, seeing that twelve months ago the accounts contained an item "war "bonus and war fund £65,019," while this year it has been abbreviated to "war fund £7264." Even then there is a round £100,000 increase as compared with a year ago. Against co-partnership, for the first time there is a blank; but the employees have only to compare the wages bill of £502,626 with that for the second half of 1913 (£306,639), and the £20,000 then charged for co-partnership, to see that, though war conditions have suppressed the charge for the latter, the wages bill has made remarkable flight.

The increase in the consumption of gas was equal to 7·35 p.ct, which is remarkably good. In volume this means some 461,766,000 c.ft.—the total sales having been 6,743,552,000 c.ft. Of the increase, 445,122,000 c.ft. in all came from private consumers; public lamps yielding the balance of 16,644,000 c.ft. The augmented sale and the higher charge of 5d. per 1000 c.ft. made the revenue from gas ascend by £194,968 to £995,122. The Company's income from secondary products has already been dealt with. Meter and stove rentals and fittings, in yielding £126,815, show a reduction of £208; but seeing that the receipts for fittings were down to £30,777—a decline of £12,151—this shows that, stove-rental being only a little higher, meter-rents are mounting up well, which testifies an accession of new custom.

In the result, the total income reached £1,651,694, or £185,009 extra. The expenditure amounted to £1,505,184, or £242,663 more. Therefore the balance of net revenue is £146,509, which is a reduction of £57,654. Financially this is not cheerful reading; but the report, as seen earlier in this article, puts explanation in a nutshell. But riding above the adversity from current circumstances is the fact that the sale of gas last half year is, despite accumulated restrictions upon its use, greater by 111,519,000 c.ft. than in the December half of 1913. This attests vitality, and throws light upon the future. Encouragement results.

Coal Brasses and Waste.

MUCH has been written and said, and it is hoped is soon going to have some effect, anent the largely increased percentage of inert materials now being distributed with coal through the absence of proper picking at the collieries. The wasteful results of this distribution throughout the national system have been emphasized; and to-day in an article in another part of this issue, Mr. P. Parrish calls attention to the uneconomy that exists through the presence of the increased quantity of coal brasses in the deliveries, also due to the current neglect of the cleansing of coal at its source. In this case, it is not rubbish, but valuable matter left in the wrong place. Its removal would enable it to be usefully employed by the chemical manufacturer in the production of sulphuric acid; its presence, so far as gas coal is concerned, is a nuisance and the promoter of deterioration of coke and of the necessity for additional expense in purification. Mr. Parrish specifies the physical characteristics of the coal brasses which are of most value to the chemical manufacturer, and describes the process of their utilization in the making of sulphuric acid. He submits that it is obvious that coal brasses of the quality mentioned are at the present time worth at least 10d. per unit of available sulphur per ton. With sulphuric acid at the current price, and the demand so much in excess of the supply, the continued waste of such a utilizable article ought not to be permitted. The objection to the presence of coal brasses from the gas engineer's point of view is not only due to his traditional idea as to the part they play in contributing to the heating-up of stored coal, but to the facts that they increase the ash content of the coke, and so depreciate its value, as well as augment the quantity of impurities in the gas in the shape of sulphuretted hydrogen and sulphur compounds. Experimental work shows that the proportion of the latter to the former is large. This means higher costs for purification in order to maintain the standards of gas purity. Besides these disadvantages, the production of tar and ammoniacal liquor is adversely affected. There are additional facts here for the consideration of the Coal Controller, to supplement

the pile that has already been laid before him in order to get him to move, in the national interests, to ensure the better cleansing of coal before its despatch from the collieries.

Methods of Dealing with Naphthalene.

IT is quite true that high carbonizing temperatures and light charges favour the formation of naphthalene, and that the heavier charges of to-day have done much, through diminishing the exposure of the gas to the hot retort surfaces, to lessen the amount of naphthalene formed. But notwithstanding the heavier charges, and the consequent reduction of the naphthalene in the gas, the trouble with its deposition has become greater since the advent of the washing of gas for the extraction of the benzol and toluol. The change in carbonizing practice and the new washing process bear the one upon the other. We do not know what would have happened if the old conditions still obtained that favoured the formation of naphthalene, with at the same time the extraction from the gas of benzol and toluol together with other hydrocarbons that, acting as solvents, kept the naphthalene in suspension. It is, indeed, most fortunate that we arrived at the stage of improved carbonization before oil and tar washing became a part and parcel of gas-works processes. However, the revival of naphthalene difficulties has to be dealt with; and Mr. W. Fletcher last Saturday described, in a paper before the Manchester Junior Association, some of the experiences at Liverpool in effecting a reduction of the deposition trouble.

In these days when naked gas-flames have become archaic, and the retention of the naphthalene in the gas has no great importance from the illuminating power point of view, it would, of course, be better if it could be eliminated on the works. But even then that the system of elimination is not positive in its results is reflected in the stoppages in the district. However, sudden cooling of the gas for the purpose is not desirable, as it causes the loss of other hydrocarbons from the gas. Better experience has been had at Liverpool with the washing of the gas with carburetted water-gas tar; and this is the preferable method when removal is sought. At the same time, it is not an absolute cure; and washing may depreciate the gas in a way not desired, by also removing other hydrocarbons. Moreover, unless there is assurance that the naphthalene is completely extracted, a supplement seems still to be required, in the way of oil vapour or mist to replace the solvents taken out by the oil-washing for benzol, in order to protect against deposition of the remnant naphthalene and to deal with old deposits. One thing that was found at Liverpool by the washing of the gas with carburetted water-gas tar was that the latter must have proper time to do its work—in other words, there must be suitable regulation. But even under the best conditions attainable, it is clear that, although the difficulties on the district were eased, they were not entirely overcome.

But the Liverpool technical staff do not pin their faith to one process more than another. Their ideas in this connection are catholic; and they require to get at the most reliable method of freeing themselves from the naphthalene difficulty by actual trial under their own conditions. They have therefore tried vaporizers and atomizers, for adding the necessary solvents to the gas either in the form of vapour or mist. But we do not gather from Mr. Fletcher's paper which system is preferred. Some engineers like one method, some the other. Both have their advocates; and the advocates think there is more intimate admixture with the gas and more effective result by one method than the other. But the results are rather indicative of a fairly common efficiency. The "Simplex" and the "Parkinson" vaporizers are both described in the paper, and so is the system of atomizing employed. In connection with the "Simplex" vaporizer, Mr. Fletcher shows how the use of a butterfly valve placed in the position explained by him, supplanting a steam-injector, has effected certain savings. Not only has it resulted in economy in respect of steam, but in the time taken to pump out the syphons on the mains on the outlet side of the vaporizing installation. One cannot, however, judge from the paper as to the relative efficiency of the vaporizers and atomizers under Liverpool conditions, as there are no data recorded individual to the systems, and one does not know anything as to whether the condition of the gas in respect of naphthalene is the same in each case. We see, however, that the rate of flow of oil in connection with the "Simplex" vaporizer is 12 gallons per day; but just how much gas this treats does not appear to be stated. In the case of the Parkinson vaporizer, the quantity of oil used is 25 gallons per day; the quantity of gas treated being 2¼ million c.ft., which means an average consumption of 11 gallons per million cubic feet. The residue collected is 1½ gallons. Whether this is of value is not mentioned. In the case of the atomizer, the consumption is 15 to 20 gallons per million c.ft. Does this larger consumption produce any compensating higher effectiveness?

The paper does not give any very definite information as to the efficiency and results of the use of these methods—in fact, it is impossible to assign to them their proper value under the changed circumstances of the Liverpool working. Not only has washing of gas for the extraction of benzol been incorporated in the working, but the proportion of carburetted water gas to coal gas has been reduced. In these circumstances, figures fail to indicate at first glance the benefits resulting from the employment of the expedients used. But, remarks Mr. Fletcher, "the real question is not how many stoppages have we had, but how many would we have had without the use of vaporizers and atomizers?" No one can tell; but no doubt the number would have been appalling. The usual experience is that, even under current conditions, the number diminishes with time—probably owing to the gradual clearing away of old deposits through the influence of the added solvents. There are signs in the paper that what is being done is improving the conditions, and that the ultimate benefit will surpass by a long way the present experience, satisfactory though this is when properly interpreted.

A Further Appeal to Readers of Papers.

APPEAL must again be made to readers of papers, and other contributors to the proceedings of Gas Associations, to remember the difficulties under which the Technical Press is working at the present time. These difficulties are increasing. The number of men available for the work at the printers has been reduced by the claims of the country, compared with the former condition, to almost vanishing point. Printing charges have ascended all round. Even our limited "ration" of paper is seriously menaced; and the price is many times more than it was formerly. Our advertisers—ordinarily the backbone of the revenue that enables the history of the gas industry in relation to its technical, commercial, and financial doings to be maintained without interruption from week to week—are not now supporting the Press, though its expenses are proportionately to the work done so much higher, with even the measure of their former liberality. In view of all these circumstances, those who make contributions by way of papers or otherwise to technical organizations must, if they wish publication, curtail them to reasonable length, and not indulge in a prolixity ill-befitting the conditions of the times. One of the papers read at the Manchester Junior Association meeting on Saturday last was by Mr. J. W. Thornley, of Salford, entitled "Notes on Distribution." It is an excellent paper in experience and pith for promoting not one discussion, but several—in fact, there is in it sufficient good material for at least three papers. Apart from the difficulties of the Press, adequate consideration cannot be given at a single meeting to the plethora of detail that the communication contains; and though we shall publish it *in extenso*, it is to be feared that its very spaciousness will cause many readers to put it aside for a more convenient opportunity, which may never occur with each week bringing its fresh supply of intelligence and matters for consideration relevant to the present situation and the possible developments from it. Extensive papers of the kind are, we are quite convinced, a mistake. However, whether or not this be so, current conditions compel us—there is no other course—to say we must from now, if the authors do not keep their papers to reasonable length, abbreviate them in a manner that may not be consonant with their views, but will fit better the conditions under which we are labouring.

The Calorific Standard and Deficiencies.

The Portsea Island Gas Company have been summoned before the Portsmouth Borough Justices for supplying gas with deficiencies in calorific value varying from a little over 2 to 16 p.ct.; their standard being 500 B.Th.U., as provided by the Order obtained from the Board of Trade under the Standard of Calorific Power Act. The Company, despite the arguments of Mr. Jacques Abady and the evidence of Mr. W. Doig Gibb, have been con-

victed, and the minimum fine of £2 has been imposed in respect of each of the sixteen informations, with ten guineas costs. On the application of Mr. Abady, the Bench agreed to state a case; and therefore we will not comment on the facts as they apply to the Portsea Island Gas Company. But a few comments on the general matter may be made, as it is of importance at the present time to all gas undertakings. Since the Standard of Calorific Power Act was passed, and since the Board of Trade determined upon 500 B.Th.U. as being a fair standard for universal application, the conditions of gas supply have undergone considerable change to the detriment of the ability of gas undertakings to maintain a standard of 500 B.Th.U.; and it is practically universally recognized now that, unless a gas undertaking is particularly favoured in respect of coal supply, it is impossible, under existing conditions, to maintain a calorific value of 500 B.Th.U. The Coal Controller knows that inferior coal, through want of picking at the collieries, is being delivered; and he himself has advocated blue water gas being supplied in admixture with coal gas in order to economize coal. To compensate for any deficiency in calorific value due to washing and other conditions, oil is required. But as Mr. Doig Gibb pointed out, to bring the 300 B.Th.U. blue water gas that the Company have to make up to 500 B.Th.U. would require at least 2½ gallons of oil, while the Government only allow the Company half this quantity. If gas companies are to be exposed, under present circumstances, to prosecutions of this kind, then the Government Departments concerned must determine between, on the one hand, placing them in a position to supply 500 B.Th.U. gas by giving them oil and ensuring the supply of good coal, or, on the other, relieve them of the necessity of washing their gas for the extraction of benzol and toluol. Which is it to be? We know the answer the Ministry of Munitions would give; and it would not be one that would corroborate the decision of the Portsmouth Justices. Under the circumstances of the day, there must be reasonableness in this matter of compliance with the calorific standard.

Gas and Oil Engine Position.

In the annual review number of "The Times Engineering Supplement," reference is made to the position of stationary gas and oil engines during the war. British manufacturers of these engines have always had a large market abroad; and although they cannot maintain it at the present time, they are making strenuous efforts to forestall competition at the end of the war. Of technical note is the fact that, although the majority of stationary gas-engines now being manufactured are of the four-cycle type, the tendency towards two-cycle construction was emphasized last year. This has perhaps been more marked in the United States than in this country; but it now seems probable that for very large gas-engines built for running on blast-furnace gas and in similar circumstances, two-cycle motors will commonly be employed. Gas makers should particularly note that little work has been done of late on the development of suction-gas producers using bituminous coal; and the opinion, it is said, "is now becoming general that, for isolated and independent plants of relatively small power, the compact and self-contained oil-engine offers greater advantages than gas plant." Cheap town gas offers to the manufacturer greater conveniences than either suction gas or oil; and the power load ought to be one of the inducements to gas engineers in industrial areas to work strenuously for the cheaper, high percentaged combustible gas which is necessary to meet the electric and oil competition which will assail their undertakings immediately after the war. A further point that is considered noteworthy by the reviewer of engine progress is that greater attention is now being paid to the employment of the exhaust gases from gas-engines for heating and other purposes.

Coke for Large-Scale Steam-Raising.

Visibly swelling is consideration of the question of a business alliance between the gas industry and the electricity supply industry, through one selling and the other buying coke for steam-raising. This, of course, is the quicker mode of linking-up between the two industries, although, on the other hand, it does not admit of the recovery of nitrogen, of which some engineers have visions by the gasification of the coke, and the supplying of electricity stations with gas for firing their boilers. Between the two systems of effecting a working connection, decision must entirely rest upon the greater financial economy. But, as remarked, the simpler plan is that of transferring coke from the gas-works to the boiler-houses of electricity stations. The mere transference of coke is not, however, the only thing to be done. It cannot be effectively used under boilers just as it comes from the coke-heap. It requires proper treatment and handling; and therefore every opportunity should be taken for making investigation. There are disadvantages to be overcome in order to gain advantages; and this applies particularly to large-scale steam-raising. In this connection, value will be found in an article appearing in another column on some trials that have been carried out at a power station of considerable dimensions. The investigation there, it will be seen, has resulted in a method of working that has achieved a good success, and has cleared away much of the argument in opposition to the use of coke for the purpose. There is a large amount of encouragement in the article; but the work must not stay at the point it has reached. Further research is required in order that the maximum efficiency may be realized in large-scale operation. This is a matter not only of importance to the gas industry, but to the nation in relation to the question of fuel economy.

Pushing the Sale of Coke.

The distribution of a well-arranged leaflet is being found by Mr. Douglas H. Helps, the Engineer and Manager of the Reading Gas Company, to result in the increased use of coke in his district. In the preparation of this leaflet there has been utilized some of the valuable information published by the London Coke Committee. It is pointed out that the use of coke for domestic and industrial purposes is now of national importance, and that there is a good stock at the gas-works, which can be supplied in small quantities. Facts well worthy of serious consideration are that there are great advantages in obtaining a supply of fuel locally; that there is very little deterioration if coke is stored in the open; and that for storage purposes the bulk of 18 bushels of coke is about equal to half a ton of coal. After showing its value as a fuel, the leaflet proceeds to tell consumers how coke should be used: "Little and often" is the secret of a good coke fire. Before it has burnt too low, poke the ash from the fire, and sprinkle on a little small coal. After a few minutes, add a layer of coke broken small. A thick fire is more economical than a thin one, and requires less attention. A good and smokeless fuel can be made by mixing two-thirds gas coke and one-third coal.

Corrections for the Pentane Lamp.

Dealing with the correction factor for water vapour in the use of the pentane lamp, Messrs. K. Takatsu and M. Tanaka (of Tokyo) furnish much experimental data. The conclusion arrived at by the authors is that the complete formula for their pentane lamp (made by Messrs. Chance Bros., and certified by the N.P.L.), as checked against the Ediswan-Fleming lamp (also certified by the N.P.L.), is:

$$I = 10{\cdot}0_2 + 0{\cdot}063_8\,(8 - \epsilon) - 0{\cdot}008\,(760 - b),$$

where I = the candle power, ϵ the litres of water vapour per m.³ of air, and b the barometric pressure in mm. of mercury. This result is practically identical with that obtained by Messrs. Paterson and Dudding at the National Physical Laboratory in 1915; but Messrs. Rosa and Crittenden, at the Bureau of Standards, in 1914, obtained the value 0·0057 instead of 0·0063 for the water vapour correction factor. The authors, by experiment, have found that the use of a ventilating hood and duct above the lamp reduces the candle power materially. Such a device was employed at the Bureau of Standards, but not at the N.P.L.; and the candle powers measured at the Bureau were much below the normal value. The authors consider that the discrepancy was due to the use of the ventilating device, and suggest that the same cause may account for the lower correction factor obtained at the Bureau.

Occupations which the National Service Department will in future regard as of national importance for discharged soldiers will (according to Sir Auckland Geddes) include gas, water, and electrical undertakings.

Referring again to the large gas-engine industry, the Manchester correspondent of the "Engineer," speaking of a visit to the works of Messrs. Galloways, Ltd., says that what the ultimate limit in size will be it would not be wise to attempt to predict. Up to now, 1000 H.P. is being obtained per cylinder; and the firm are either building or have on order eight engines which are designed to give this amount of power per cylinder. These engines are of the horizontal double-acting four-cycle pattern, with two cylinders and a single crank. In addition, they have orders on their books for three engines of this type of 1200 H.P. and two of 1500 H.P.

SCHEDULE OF PROTECTED OCCUPATIONS.

Modifications Now Operative.

[*See Explanation in Editorial Columns.*]

BECAUSE of the need of further recruits for the armies in the field, it has been found necessary to revise the Schedule of Protected Occupations which came into operation about nine months ago, and was noticed at length in the "JOURNAL" for May 1 last year [p. 181]. Therefore a new schedule has been issued—M.M. 130 (Revised)—the main effect of which, as was pointed out on p. 200 of last week's issue, is to render available for recruitment all men medically classified fit for general service (Grade I.), who had not attained the age of 23 by Jan. 1, 1917, whatever their occupation or the work upon which they are engaged, except hull construction and repair. As, however, this will not by itself provide a sufficient number of Grade I. men, a higher age has been fixed in certain occupations below which Grade I. men will be recruited. Men of military age engaged on Admiralty, War Office, or munitions work, or in a railway workshop, whose occupation is not scheduled, are not entitled to protection on occupational grounds if they are medically classified Grade I.

The present schedule, which came into operation on the 1st inst., does not confer right of exemption from military service. If a man is medically classified as fit for general military service (Grade I.), he is protected by the schedule only if he satisfies all the following conditions: (*a*) Is engaged on Admiralty, War Office, or munitions work, or in a railway workshop, or alternatively, if not so engaged, is enrolled as a war munitions volunteer; and (*b*) is employed in a scheduled occupation; and (*c*) had on Jan. 1, 1917, attained the age set out in the schedule as governing his occupation; and (*d*) entered the scheduled occupation (not necessarily with the same employer) on or before Aug. 15, 1915; or (*e*) alternatively to (*d*), if the occupation is marked (*a*) in the schedule, entered the occupation (not necessarily with the same employer) before Jan. 1, 1918. If a man is medically classified lower than Grade I., he must satisfy (*a*), (*b*), and (*d*) or (*e*) of these conditions; but he need not satisfy (*c*). If a man's medical grade is not known, and he is below the age limit for the occupation in which he is employed, he cannot claim protection under the schedule till his medical grade has been determined.

Protection may be withrawn at the discretion of the Government Department concerned from any man of military age, protected under the schedule, who is engaged upon work which can be performed by women or by males not fit for general military service, or by males over military age. In the case of any man employed in an occupation marked (*s*) in the schedule, the Admiralty, War Office, or Ministry of Munitions, as the case may be, may require that a substitute is provided who, in their opinion, is satisfactory, before the man is released for military service. Men released will be posted to non-technical corps, if there is no demand for them for technical corps. If skilled artificers needed for the army cannot be supplied from other sources, men engaged in any occupation protected under the schedule may, by arrangement with the Admiralty, War Office, Ministry of Munitions, or the Board of Trade, be called up for military service in a technical corps.

There are three certificates issued under the Schedule of Protected Occupations: (1) The Scheduled Occupation Certificate, which certifies that the holder is engaged in an occupation covered by the schedule. (2) The Protection Certificate, which is issued to men employed on Admiralty, War Office, or munitions work, who are not qualified to receive a No. 1 certificate. This operates as a protection from recruitment until a calling-up notice stamped by the local Munitions Area Recruiting Officer is issued. A calling-up notice not so stamped does not cancel this certificate where it is properly held. (3) The W.M.V. Form, issued to men engaged in scheduled occupations who, in other respects, are qualified to hold a Scheduled Occupation Certificate, but are not employed upon Admiralty, War Office, or munitions work, and who, being eligible for enrolment as War Munitions Volunteers, have so enrolled. This certificate is held pending the transfer of the holder to Admiralty, War Office, or munitions work. Certificates rightly held under the original Schedule of Protected Occupations will continue operative unless they are withdrawn on the ground that the holders are no longer protected by the schedule as revised, or when required by the provisions thereof. Note must be taken of the fact that the revision of the schedule has effected changes in the definition of certain occupations; and so it may be that men formerly covered by a code number in the original schedule are not now protected, though the code number still remains in the schedule.

Scheduled Occupation Certificates will in future be granted to men engaged in scheduled occupations who are below the age limits set out in the schedule, if they have been medically classified lower than Grade I. They will be entitled to retain these certificates for so long as they remain medically classified lower than Grade I., subject to the provisions of the schedule. Men engaged on Admiralty, War Office, or munitions work in the industries protected in the schedule, who are medically classified lower than Grade I., will not for the present be recruited, except under the provisions referred to, unless it is decided that the army require the release from such work of men in the lower medical grades.

The protection set out in Section F (Engineering) applies to every man engaged in an occupation therein set out who is employed on Admiralty, War Office, or munitions work, or in a railway workshop, whether employed in an engineering works or elsewhere, unless his occupation is specifically set out under the section or subsection which deals with the industry in which he is engaged, or unless he is a colliery worker. With these reservations, any man in an occupation covered by Section F is protected as defined by that section, and cannot claim to be covered by any code number outside it. Men engaged in the building trade or on works of construction are not protected under the schedule, except as provided in this paragraph. Except as regards coke-oven plants, men who are engaged in occupations covered by the schedule, and are employed in or about a mine where coal is worked, either alone or together with any other mineral, are not entitled to protection under the schedule or to W.M.V. protection certificates. Such men fall within the jurisdiction of Colliery Recruiting Courts.

It is stated that the national need at the present time does not permit of the retention on Admiralty, War Office, or munitions work of any man of military age who does not devote his whole time and energies to the work. No man found to have a bad record of absence from work will therefore continue to be protected by reason of being employed in an occupation covered by the schedule. An opportunity will, however, be given him of showing sickness or other reasonable cause. Claims for Scheduled Occupation Certificates or for W. M. V. Protection Certificates may be put forward by men or by the officials of their trade unions on their behalf to the Enlistments Complaints Sub-Committees. The procedure set up under the schedule for dealing with men on Admiralty, War Office, or munitions work does not affect the right of a man to apply to the Local Tribunal on personal grounds under the regulations and instructions for the time being in force. The schedule does not purport to deal with all the industries in which the Government Departments are interested.

SOME PROTECTED OCCUPATIONS.

SECTION B.—MINING AND QUARRYING.

Fire-Clay Mining; Silica Stone, Silica Sand and Moulding (Foundry) Sand, Quarrying.

Code No.		Age Limit (calculated as on Jan. 1, 1917).
0071	All underground workmen in mines	24
0072	Getter or Quarryman in Quarries	24
0073	Foreman (above ground)	32

SECTION C.—FURNACE FIRE-BRICK.

Furnace Fire-Brick (including Ganister, Magnesite; Fire-Clay, Chrome and Silica Brick) Manufacture.

0211	All classes of workmen except unskilled men	23

SECTION D.—COKE-OVEN PLANT.

Coke-Oven Plant (excluding bye-product plant workers who are dealt with under "Chemicals and Explosives," see Section L.

0261	All classes of workmen except unskilled	25

SECTION E.—METAL MANUFACTURE (NOT FOUNDRY).

Iron and Steel.

0311	All classes of workers (except unskilled men) engaged in the manufacture of iron and steel, from the treatment of the ore to and including the production of the metal in standard forms such as ingot, billet, bloom, bar, rod, plate, or section, but excluding all workers engaged in the manufacture of steel sheet, tinplate, blackplate, or terneplate	23

Steel Sheet Manufacture.

0312	All classes of workers (except unskilled men)	42

Tinplate, Blackplate, and Terneplate Manufacture.

0313	All classes of workers (except unskilled men)	42

SECTION F.—ENGINEERING (INCLUDING BOILER MAKING AND ERECTION, REPAIR, AND MAINTENANCE OF PLANT AND MACHINERY.—See explanation above.

[The occupations set out under Section F occupy three pages of the schedule, under the headings of riveters, platers, &c.; fitters, erectors, toolmakers, &c.; turners, metal machinists, toolsetters, &c.; electricians; foundry workers; smiths, forge workers, stampers, &c.; and other workers. The age limits vary.]

SECTION J.—MISCELLANEOUS METAL TRADES.

Tube and Tube Fittings Manufacture—Iron, Steel, Copper, Aluminium, and Alloys

0921	All classes of workmen except unskilled	23

SECTION L.—CHEMICALS AND EXPLOSIVES MANUFACTURE, &c. (including the manufacture and production of chemicals [solid, liquid, and gaseous], coal tar products, fertilizers, oils [by chemical process], and smoke producing material, where the materials are required directly or indirectly for Admiralty, War Office, or munitions work).

1121	(*a*) Foreman	27
1128b	(*a*) Process Workers on plant producing poison gases or material therefor, or on plant producing oxygen, hydrogen, or nitrous oxide	26
1128c	(*a*) Process Workers (others) skilled	34
1129	(*a*) Filler of Chemical and Gas Projectiles and Cylinders	28
11210	Gas Cylinder Tester (skilled)	28
11211	Gas Cylinder Valve Fitter (skilled)	28
11212	Still and Retort Fireman and Attendant (skilled)	28
11213	Pitch Getter	32

SECTION P.—MISCELLANEOUS TRADES AND OCCUPATIONS.

Engine Men, Shunters, and Boiler Men, Crane Drivers, &c. (in the employment of firms engaged in the industries protected in this schedule).

1601	Steam Engine Driver (stationary engine or works locomotive)	28
1602	Shunter (in works yard)	28
1603	Power Crane Driver (other than electrical crane)	32
1604	Boiler Fireman or Stoker (leading hand)	28
1605	Boiler Fireman or Stoker (not leading hand)	32
1606	Grab Crane Driver	32
1607	Platelayer in Works	36
1701	*Patent Fuel Manufacture.* All classes of workmen, except unskilled men and shippers	27
1711	*Retort or Furnac eBuilder, Repairer, or Skilled Retort Setter* (in the direct employment of firms engaged in the industries protected in this schedule	28

SECTION Q.—LIGHT AND POWER UNDERTAKINGS.

Gas Undertakings (excluding men engaged on coal tar products, for which see under "Chemicals and Explosives" Section L).

1931	Foreman	25
1932	Assistant Foreman (except in coal and coke department, flue cleaners, and yard)	25
1933	Grab Crane Driver	25
1934	Valveman or Governor House man	23
	Carbonizing Department (Coal Gas).	
1941	Charging or Discharging Machine Driver-repairer) (skilled)	23
1942	(*a*) Gas Stokers (*i.e.*, men engaged in operations of charging and discharging by hand horizontal or inclined retorts in which coal is carbonized; lid-men in retort-houses with stoking machines; top and bottom men on vertical retorts; and hot-coke wheelers in subways)	32
1943	Fireman, clinkerman, pipe-jumper, pipe-tier, plugger-up, poker-in, scaler, scurfer.	32
	Carbonizing Department (Carburetted Water Gas).	
1951	Gas Makers	25
	Outdoor Departments.	
1961	Gas-Fitter (skilled)	28
1962	Main Layer, Jointer, or Service Layer (skilled)	25
1963	Mates to men covered by Code 1962	36
1964	Supervising meter repair mechanics (skilled)	32
1965	Valve men and district syphon men	32

SECTION R.—PROFESSIONAL OCCUPATIONS, ADMINISTRATIVE AND TECHNICAL STAFF.

Professional Occupations.

2001	(*a*) Chemist (Works, analytical, or research)	23
2002	Mechanical Engineer (Professional)	23
2003	Electrical Engineer (Professional)	23
	Administrative and Technical Staff employed on staff of firms engaged in the industries protected in this schedule.	
2011	The Working Principal of a firm	25
2012	Managing Director	25
2013	Works Manager	25
2014	Assistant Works Manager	25
2015	Head of an Administrative Department	25
2016	Practising Professional Accountant	25
2017	Technical Staff and Clerks possessing high technical knowledge — *e.g.*, Estimating or Cost Clerk, &c.	25
2018	Timekeeper in works with 1000 employees or over	28
2019	Storekeeper (works general stores or engineering works tool stores) in works of 250 employees or over.	28

PERSONAL.

Second-Lieutenant T. J. ORME, Machine Gun Corps (a member of the staff of the Windsor Street Gas-Works, Birmingham), was awarded the Military Cross at a recent investiture held at Buckingham Palace, for gallantry in an engagement east of Ypres.

Mr. W. H. BENNETT has relinquished the position of Engineer and General Manager of the Redhill Gas Company, upon acceptance of a seat on the Board of the Company. He will, however, as Managing-Director, continue to devote his energies in the interests of the undertaking.

Mr. G. F. DUNN, the Engineer, Secretary, and Manager of the Blandford Gas Company, has been appointed to fill the post of Secretary and Manager of the Wells Gas Light Company (Somerset), rendered vacant by the death of Mr. H. Alley. Mr. Dunn expects to take up duty at Wells shortly.

Mr. W. A. SCOTT, J.P., F.C.A., who has accepted a seat on the Board of the Ascot District Gas and Electricity Company (in place of Dr. H. J. Strong, J.P., of Worthing, who has resigned) has been connected with the Company since its incorporation, and has been Secretary since 1898. Mr. H. T. MANWARING has been appointed to succeed him as Secretary.

In the first issue of the "JOURNAL" published this year, it was stated that Private RALPH AUSTIN HERRING, 14th Battalion of the London Regiment, had been posted as missing; and the hope was expressed that, as his friends had had to leave him wounded, he might have been made prisoner. This hope, we are pleased to learn, was fully justified—Mr. W. R. Herring having written to say that his son is a prisoner, and in hospital. Though confined to bed (and likely to be so for some two months) with broken foot bones, he is otherwise well and cheery, and is being given every attention.

In the list of honours which His Majesty lately awarded, we are pleased to notice the names of seven employees of the Gas Light and Coke Company. The Medal of the Order of the British Empire has been awarded to G. W. BADSEY, W. J. TIDEY, W. G. NEWSON, G. H. JORDAN, J. D. HARRIS, and J. CORDER, fire brigade men, and to F. PAYNE, foreman, for conspicuous bravery and devotion to duty on the occasion of an explosion, followed by fire, which occurred at the Company's bye-products works, resulting in the death of one man, and injuries to two others. The men, though they knew well that there were large quantities of inflammable and explosive materials surrounding them, fought the fire, and eventually succeeded in subduing the outbreak, which would otherwise have resulted in very serious loss of life, destruction of material and plant, and interruption to the supply of important munitions.

OBITUARY.

WILLIAM HARDIE.

JUST as the "JOURNAL" was being made up for press this week, news came of the death at North Shields on Saturday of Mr. William Hardie, the Engineer of the Tynemouth Gas Company. The sad event occurred at his residence at Cullercoats. Postponing till next week some fuller particulars of his professional career, it may be mentioned that, though Mr. Hardie had been in failing health for a few years, the end came rather suddenly. As recently as Wednesday he was attending to his public duties, and sat on the Bench at the North Shields Court; but during the day he had a seizure while in a railway train, and was conveyed home.

Mr. Hardie had been Engineer and Manager of the Tynemouth Gas Company for close upon forty years, having been appointed to the position at the early age of 22. When he joined the Company, the make of gas was 125 million c.ft. a year; and he saw the output grow to somewhere about 580 millions. The affection and esteem in which he was held by the employees was manifested by the presentation to him of a handsome gold watch, on his completion in 1904 of twenty-five years' service as Engineer and Manager—which interesting event curiously coincided with his return at the head of the poll as a member of the Town Council. In 1916, he undertook the duties of Acting President of the North of England Gas Managers' Association (owing to the death of Mr. Mark Fligg, of Redcar); and in his address to the members in October of that year he referred to the constant progress that had been made during the time he had been with the Company.

Mr. Hardie will be missed from the meetings of the Institution of Gas Engineers, with whose work he was intimately connected; and he was also an associate member of the Institution of Civil Engineers. In his own immediate work as a Manager, he was, as already remarked, beloved by his staff and men; as an engineer, his work showed a broad ability; and as a professional colleague, he was admired throughout the entire ranks. When he spoke at the meetings of the Institution or the North of England Association, his remarks were followed with the closest attention, for everyone recognized that he spoke from the dictates of a very wide experience.

The Burnley Corporation Gas Department have lost a valuable official by the death of Mr. RICHARD MANLEY, who passed away at the age of 64 years. For about a quarter-of-a-century he had been connected with the department—being the Outside Distribution Superintendent.

The 48th annual meeting of the Manchester District Institution of Gas Engineers will be held at the Victoria Hotel, Manchester, on Friday, March 1, when, in addition to the usual routine business, Mr. J. P. Leather, of Burnley, will be inducted as the new President.

At the meeting last Saturday week of the Coke-Oven Managers' Association (Midland Section), Mr. Gerald Lant (the Hon. Secretary) announced that the next meeting will take place on Feb. 23, at Leeds, when Mr. Greaves will contribute some "Notes on the Manufacture of Concentrated Liquor."

In a lecture on the "Internal Combustion Engine," before the Belfast Association of Engineers, Prof. J. H. Smith, describing the characteristics of the Humphrey gas-pump, expressed the opinion that its introduction marked the beginning of a new era in internal combustion engineering. It not only incorporated most of the ideas of previous workers, but opened out an entirely new field for engineers and experimenters.

RETIREMENT OF CAPTAIN R. S. HILTON

From the Birmingham Corporation Gas Department.

AMONG a far wider circle of friends than those in the Birmingham Corporation, keen regret will be felt at the news that the industry is to lose the services of Captain R. S. Hilton—whose resignation of his position as Secretary and Manager of the Gas Department in that city was announced in a letter read at a meeting of the Gas Committee (presided over by Alderman Sir Hallewell Rogers) on Monday of last week.

The feeling of the Committee themselves in the matter is indicated by the following resolution, which was proposed by Sir Hallewell Rogers, seconded by Alderman Lloyd, and supported by the Lord Mayor (Alderman Brooks), and unanimously passed: "That Captain R. S. Hilton be informed that the Committee accept his resignation with deep regret; and they desire to place on record their appreciation of the uniform courtesy, tact, and conspicuous ability he has displayed in the service of the Committee since his appointment in May, 1910. They recognize that the enormous growth of the department during the last seven years has been in no small measure due to his wisdom and energy; and they desire to assure him of their best wishes for his success in his new career."

Formerly the General Manager of the Clay Cross Coal and Iron Company, near Chesterfield, Captain Hilton was appointed to his present position in succession to the late Mr. G. Hampton Barber. With the sanction of the Council, he joined the 1st Birmingham Battalion of the Royal Warwickshire Regiment, on its formation in September, 1914; and in March of the following year he was transferred to Lord Moulton's staff in the High Explosive Department of the Ministry of Munitions, in order to superintend the erection and working of plants at various gas-works throughout the country for the extraction of toluol, benzol, &c. By permission of the Gas Committee, he was able to make his chief offices at the Gas Department, and has thus been able to render considerable assistance to the Committee, at whose meeting it was mentioned that, though officially in the service of the Ministry of Munitions, he had not grudged any time and labour in his endeavours to make his loss to the department as light as possible. Captain Hilton was responsible, too, for the formation of the Birmingham and District Munitions Committee, and is now on the Board of Management of the National Shell Factory, Washwood Heath.

The growth of the department since Captain Hilton's appointment as Secretary and Manager in 1910 has been very remarkable; the output of gas having increased by practically 60 p.ct. There is said to be every possibility that this year the quantity of gas made will exceed that of the South Metropolitan Gas Company—the second largest undertaking in the kingdom. The turnover of the department in the year ended March, 1910, was £940,000; whereas in the year to March, 1917, it amounted to £1,750,000, and will, of course, be very much higher in the current year.

It was mentioned by the Chairman of the Gas Committee that an outstanding feature in Captain Hilton's career in the department had been the happy relations which had existed between him and the whole of the staff and workpeople. His tactful handling of many difficult labour questions had been most marked; and his departure would be keenly regretted by every one of the employees.

It is understood that Captain Hilton has accepted an important position with the Metropolitan Carriage, Wagon, and Finance Company, Ltd.

NOTES FOR GAS CHEMISTS.

More Gas Chemists Required.

EFFICIENCY and economy in gas-works operations and the development of gas-works processes are claiming more than ever the services of the chemist. Without chemical checks, it is impossible to maintain full efficiency and economy upon the works, and without chemical training it is useless to expect to keep the close supervision that is necessary, for example, in connection with the limitation of inert constituents and to ensure the best possible being done in benzol recovery and rectification. Those responsible for the technical management of gas undertakings are realizing that a gas chemist or an assistant with chemical training is a profitable investment. In the five numbers of the "JOURNAL" issued in January, there have been no less than seven advertisements (some of them repeated more than one week) for chemists, assistant chemists, or engineering assistants with chemical knowledge. The larger gas undertakings have, of course, their chemists and laboratories; but it is very obvious that those who are responsible for the working of undertakings that have managed to get along without chemists so far are now beginning to realize the advantage of having one, or at any rate of having a chemically qualified engineering assistant. Such assistants with chemical knowledge will stand a better chance in future than those who cannot include such qualification in the recommendations they can advance, more especially having in view present, and probable prospective, changed circumstances upon gas-works. The gas chemist and for the smaller works engineering assistants with chemical training have a fine opportunity; but it may be suggested that those responsible shall take into account that they are dealing with technical men whose work is of that protecting nature which saves money. This sometimes appears to be overlooked.

INCREASE IN THE ASH CONTENT OF COAL.

WHILE the Government departments in this country have shelved the matter of increased ash in coal by the statement that they are willing to consider individual complaints, although it is obvious that users do not care to increase the present difficulties of supply by action that might create prejudice against them on the part of the coal interests, the effect on the production, conservation, and economy of fuel, and transportation difficulties has not been passed over without notice by the United States Bureau of Mines.

The Director of this department, Mr. Van H. Manning, in discussing the general need for conservation of fuel in boiler-rooms, has referred to the important bearing of quality on the question. The quantity of coal raised in 1916 was 600 million tons; and the 1917 production would probably reach 650 millions. The preparation of the coal, however, was not now so good as in normal times; and many analyses made by the Bureau showed a great increase in the percentage of ash—coal of normal 6 to 8 p.ct. now running to 16 to 18 p.ct., and probably the average increase was not less than 5 p.ct. as compared with previous years. On this basis, 32½ million tons out of the output for 1917 was nothing but worse than useless incombustible matter; and the effect on the present difficulties of transport and shortage of trucks, though considerable, was not the end of the matter. Government experiments made at the St. Louis Exposition showed that, in addition to the proportionate loss by dilution, the increase of ash diminished the efficiency of the remaining good fuel to the extent of 1½ p.ct. for each addition of 1 p.ct. The above estimate therefore represented not 5 p.ct., but 12½ p.ct. decrease in effective duty; and the practical value of the 1917 production would not exceed that of 570 million tons of normal prepared coal. Instead of nearly 10 p.ct. increase, there would thus be a decrease in effective fuel value of 30 million tons. If the increased needs meant greater production to the extent of 100 million tons, there was a deficiency, not of 50 million tons, but of 130 million tons to be covered by good engineering and fuel economy.

The same line of argument applies at least with equal force to the use of coal for gas making; and it would be easy to show that the loss at the gas-works on an additional 5 or 10 p.ct. of ash is in far greater ratio than would be indicated by direct proportion. This is the factor that influences questions of transport, mileage, and shortage of trucks. The matter may be submitted to the consideration of the National Gas Council as the basis of an application to the Coal Controller.

Women Workers in the Gas Industry.

As the result of a visit to Beckton, and an interview with Mr. D. Milne Watson, the Editor of the "World's Work" was enabled to give, in the January issue, some interesting particulars with regard to the women workers of the Gas Light and Coke Company. There are, it appears, nearly 1600 of them. Slightly more than one-half are distributed almost equally between the gas-works and the clerical staff at Horseferry Road and elsewhere. Next in numerical order, and not far behind, comes the gas sales department, then the stove and meter shops, and finally the products works; while there are about a hundred women doing what are more or less odd jobs in other departments. The impression that Mr. Milne Watson has gathered from his own observation and from the reports of the officials responsible for the various sections within the Company is that the women's work is in general highly efficient. The quantity of the output, he says, may not equal that of a man—the Company reckon that it takes five women to fill the places of four men; but the quality is as a general rule most creditable. Answering a question, he stated that perhaps the heaviest task they give to women is that of emptying and re-charging the purifiers. In the mantle maintenance department there are some 300 women employed. New hands are given a fortnight's practical training in the cleaning, regulation, and adjustment of the various types of incandescent gas-lamps under an experienced man or woman. This is followed by an examination; and then they are allotted a small round of, perhaps, 70 lights a day, for which they are entirely responsible, though a forewoman occasionally accompanies or visits them. At the end of six weeks training they are expected to maintain 600 burners per week, with a steady increase up to 825. This work is being very efficiently performed by the women. Then there are women motor drivers, clerks, show-room attendants, electricians, &c.—all doing very good work. In fact, concluded Mr. Milne Watson, "the women have been splendid; and although we shall gladly welcome back those of our 4000 odd employees on active service who return to us, that welcome must not be construed as inappreciation of the invaluable work performed by the women during these critical years." A series of [excellent photographs are a feature of the article.

GAS BILLS AND PROVISIONAL ORDERS FOR 1918.

SIXTH ARTICLE.

WE conclude to-day our survey of the Gas Bills and Provisional Orders for consideration by Parliament in the ensuing session.

Before proceeding with the review of Bills in their alphabetical sequence, there falls for notice a late promotion by the Rhymney and Aber Valleys Gas and Water Company. Under an agreement made in the year 1898, it was arranged that the price of gas either for public or private lighting should not be increased beyond 4s. per 1000 c.ft., with a discount on the price of gas consumed by street lamps at the rate of 10 p.ct. By the Company's Act of 1914, it was provided that the price to be charged for gas in the urban district of Gelligaer should not at any time after Oct. 1, 1914, until Sept. 30, 1916, exceed 4s., and should not after Oct. 1, 1916, to Sept. 30, 1921, exceed 3s. 9d. per 1000 c.ft. The prices named have under war conditions become inadequate. In the Bill, it is proposed that the maximum price to be charged in the urban districts of Rhymney and Gelligaer shall be, from the passing of the Act, 4s. 6d. per 1000 c.ft. For public lighting the charge contemplated is 4s. 6d., with a discount of 10 p.ct. A few other clauses of the ordinary present-day form are included. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Southampton Gas Company are asking for a temporary increase in their maximum prices. The capital entitled to dividend which the Company is authorized to issue is £894,000, of which £647,740 has been issued. It consists of fully-paid ordinary stock, bearing a uniform maximum rate of dividend of 5 p.ct. per annum. By the Act of 1898, the prices which the Company might charge for the supply of gas were reduced, and the maximum prices to be charged were put at 3s. 6d. per 1000 c.ft. within so much of the limits as comprise the county borough and the urban district of Eastleigh as the same existed at the date of the passing of the Act, and 4s. 6d. within the remainder of the limits. Since the passing of the 1898 Act, the prices charged have been considerably below the authorized maximum prices. In 1914, the prices were 2s. 10d. in the county borough, 3s. 2d. in Eastleigh, and 3s. 4d. to 4s. in the remainder of the limits. The fixed maximum prices were ones at which it was considered the Company could, having regard to the cost of manufacture then prevailing, sell their gas, and with due care and management pay dividends on the capital at the before-mentioned rates. Owing to circumstances arising out of the war, the cost of the production of gas has largely increased, and is still increasing, not only as regards the cost of fuel, but also in many other matters involved in the production; and it is unlikely that the cost will in the near future approximate to the cost of production on which the maximum prices were fixed. It is therefore proposed that, as from the date of the passing of the Bill, section 5 of the Company's Act of 1898 shall be read and construed as if the words "four shillings and six pence" were therein substituted for the words "three shillings and six pence," and as if the words "five shillings and six pence" were therein substituted for the words "four shillings and six pence." The provisions of this section, it is proposed, shall cease to operate at the expiration of a period of three years from the termination of the war, or at the expiration of any extension of the period which may be granted by the Board of Trade. [*Parliamentary Agents: Messrs. Sherwood & Co.*].

By the Swansea Gas Order of 1888, the maximum price of gas within the borough was fixed at 3s. 6d., and as regards the gas supplied outside the borough at 5s.; and by the Company's Act of 1898, the maximum price of 3s. 6d. was applied to the borough as extended by the Swansea Corporation Act of 1889. By the Company's Order of 1910, it was enacted that the price of gas supplied within a distance of a mile of the then existing boundary of the borough should as from Jan. 1, 1911, be the same as that for the time being charged within the borough; and for gas supplied at a greater distance than a mile from the boundary of the borough, it should, except in the parish of Oystermouth, not exceed by more than 4d. per 1000 c.ft. the price for the time being charged in the borough. The Company therefore propose that—

> Notwithstanding anything contained in the recited Acts, the respective maximum prices now authorized to be charged by the Company for gas supplied throughout their limits of supply are hereby increased by 1s. per 1000 c.ft.—that is to say, to 4s. 6d. for gas supplied within the borough of Swansea and within a distance of one mile of the existing boundary of the said borough, and 4s. 10d. for gas supplied to all other parishes and places within the Company's limits of supply (other than the parish of Oystermouth), and 6s. in the parish of Oystermouth. This section shall come into force as from the quarter day next following the date of the passing of this Act, and shall remain operative for five years from the quarter day next following the date of the declaration of peace on the conclusion of the present war.

The Board of Trade are to be given power to extend the period. It is proposed that the Company shall have the right to pay a maximum dividend at the rate of 6 per cent. on any authorized ordinary capital which may hereafter be issued, and 5½ p.ct. in respect of any preference capital hereafter issued, unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend on the ordinary capital which may have fallen short of 6 p.ct. On any debenture stock issued subsequent to the passing of the Bill, it is proposed that the rate of interest shall not exceed 6 p.ct. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*]

The Tynemouth Gas Company's maximum price in the borough and in the urban district of Whitley and Monkseaton is 3s. per 1000 c.ft.; and for a prescribed period they now propose that—

> Notwithstanding anything contained in the recited Acts, the maximum prices now respectively authorized to be charged by the Company for gas supplied throughout their limits of supply are hereby increased by 1s. per 1000 c.ft.: Provided that the price for gas supplied by the Company to persons who shall burn the same by meter shall not exceed in the urban district of Earsdon by more than 6d. per 1000 c.ft. the price charged within the county borough of Tynemouth and the urban district of Whitley and Monkseaton, and shall not exceed in the urban district of Seaton Delaval by more than 1s. per 1000 c ft. the price charged within the said county borough and urban district.

It is intended that this provision shall continue operative for five years from the quarter day following the declaration of peace, with power of extension or variation of terms as the Board of Trade may think fit. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*]

The Wandsworth, Wimbledon, and Epsom District Gas Company ask for compulsory purchase powers over certain land delineated on deposited plans. They also desire to stop up, or discontinue for public use, Church Walk running from Fairfield Street to a point near the tramway depôt of the London County Council, without acquiring the depôt or the property known as the "Ship" public house. The Company are also adopting the model provisions as to residual products, including the one-third purchasing power. They desire, in addition to the amount they are by their Act of 1912 authorized to raise by way of debenture stock, to issue redeemable debenture stock to an amount not exceeding £100,000. The powers in this respect are to cease at the expiration of fifteen years; and any redeemable debenture stock then outstanding is to be redeemed, and is not to be re-issued. For the purpose of redemption, the Company ask to be empowered to issue new ordinary stock, or preference stock, or debenture stock, or by borrowing on mortgage under the Act of 1912, and if, and so far as, such repayment or redemption shall not be effected by means of moneys so raised, the Company may raise such sum or sums as may be necessary by the creation and issue of new ordinary or preference stock, or partly in one way and partly in the other, and by the creation and issue of new debenture stock. Then follows a clause to empower the Company to raise by the issue of redeemable preference stock any portion of the capital they are authorized by the Act of 1912 to raise as preference capital, and by the issue of redeemable debenture stock any money which they are authorized under the same Act to raise by the issue of debenture stock. Redemption is to be at such times and in such manner, and on such terms and conditions, as are expressed on the certificates of such redeemable preference and debenture stock. Other clauses of the now ordinary form in connection with gas supply are included in the Bill. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Yeadon and Guiseley Gas Company are working under a standard price of 3s. per 1000 c.ft. They now propose the following temporary modification of the sliding-scale:

> In respect of the year 1918, and every subsequent year during which the cost of the manufacture and distribution of gas by the Company exceeds the like cost during the year 1913, by reason of any conditions arising directly or indirectly through the present war, and in consequence whereof the price of gas charged by the Company in that year exceeds the price charged by them in the year 1913, the Company may, notwithstanding anything in section 4 [Price of Gas with Sliding-Scale as to Dividend] of the Act of 1899, pay to the holders of each class of ordinary shares or stock in the capital of the Company, dividends at a rate exceeding the rate which would be payable in respect of that year on such class of shares or stock under the said section of the Act of 1899 had this Act not been passed, by an amount equal to four-fifths of the difference between the rate of dividend paid in respect of that class of shares or stock for the year 1913 and the rate of dividend which would be so payable as aforesaid.
>
> Provided that if in any year the dividends which may be paid by the Company under the foregoing provisions of this section shall comprise a fractional amount of 5s. p ct. the Directors of the Company may in their discretion add the same or any part thereof to the reserve fund, or defer the payment of the same or any part thereof until the payment of, and pay the same or such part thereof with, the next or some succeeding dividends.

It is proposed that the provisions of this section shall continue in force only for the period during which the cost of the manufacture and distribution of gas by the Company is increased by conditions arising directly or indirectly through the present war; and any dispute under this section as to whether such conditions have ceased to exist shall be determined by the Board of Trade. [*Parliamentary Agents: Messrs. Rees and Freres*].

By the York Gas Company's Act of 1912, their consolidated ordinary stock is entitled to a standard dividend of 4 p.ct. per annum, subject to increase or reduction by 2s. p.ct. for each penny by which the price within the inner area is below or above the standard price of 2s. 3d. By virtue of the Act of 1912, any new ordinary shares or stock created and issued under the Act would be entitled to a standard dividend of 6 p.ct. per annum, subject to increase or reduction by 3s. p.ct. for each penny by which the price of gas supplied by them within the inner area is

below or above the standard price. The price charged within the inner area in the year ending on Dec. 31, 1913, was 2s. 1d., at which price the authorized rate of dividend on the consolidated ordinary stock was £4 4s. p.ct.; and this for the past half year was reduced to £3 12s. p.ct. owing to increases in price. As a further increase of price is inevitable, so is a reduction of dividend. At the price of 2s. 1d., the authorized rate of dividend upon any new ordinary shares or stock created and issued under the powers of the Act of 1912 would have been £6 6s. p.ct. per annum; and at the price charged last half year, the authorized rate of dividend would have been £5 8s. p.ct. per annum. The Company propose that—

In respect of the year ending on Dec. 31, 1918, and any subsequent year during any part of which the price per 1000 c.ft. charged by the Company for gas supplied by them within the inner area shall exceed 2s. 1d. shall be at such rate per centum per annum as the Company or (in the case of an interim half-yearly dividend) the Directors thereof may from time to time determine, not exceeding—

(*a*) In the case of the consolidated ordinary stock, the rate of 4 p.ct., or a rate less than £4 4s. p.ct. by 5d. for every £100 of such stock in respect of each penny or part of a penny by which such price exceeds 2s. 1d. (whichever of those rates shall be the higher), and so in proportion for any fraction of £100 of that stock.

(*b*) In the case of the 1912 capital, the rate of 6 p.ct. or a rate less than £6 6s. p.ct. by 7d. for every £100 of such stock in respect of each penny or part of a penny by which such price exceeds 2s. 1d. (whichever of those rates shall be the higher) and so in proportion for any fraction of £100 of that stock.

It is also proposed that nothing contained in the Act of 1912, or any other Act relating to the Company, shall prevent them from charging from time to time such a price for gas as to produce (together with the revenue derived from any other source) a revenue of such amount as to provide sufficient net divisible profits for the payment of the dividends authorized by the foregoing section. The provisions are to have effect as from the end of the year terminating on or next after the expiration of two years from the conclusion of the war, or such longer period as the Board of Trade may think fit. [*Parliamentary Agents: Messrs. Dyson & Co.*]

PROVISIONAL ORDERS.

The Arlesey Gas Company are desirous of extending their limits of supply, raising additional capital, and to be invested with other powers. The parishes of Clifton Langford and Shefford in the rural district of Biggleswade in the county of Bedford are the areas which it is proposed to incorporate in the limits of supply; but the Company are not to exercise the powers sought in Shefford or Clifton until they have purchased the undertaking of the Shefford Gas and Coke Company, Ltd., power to do which is sought. Additional works powers are proposed in respect of scheduled lands. As to capital, it is desired to be empowered to create and issue the sum of £4790 (being the portion of the authorized capital of £12,000 remaining unissued) as preference shares entitled to a preferential dividend or interest not exceeding 7 p.ct. per annum. The Company also ask that, in addition to the capital authorized by the Act of 1901, they may from time to time raise any further sums not exceeding in the whole £9000, and borrow up to one-third part of the new capital issued and fully paid up. The dividends payable on the original capital are not to exceed 10 p.ct. on the part that has been issued as ordinary, and 7 per cent. on the part issued as preference. On the new capital, the dividend is also not to exceed 7 p.ct. Debenture powers are sought. It is requested that the limitation of interest to 5 p.ct. imposed by the Act of 1901 on borrowed money be repealed; and in lieu thereof it is provided that the Company shall not, without the consent of the Board of Trade, pay interest at a higher rate than 6½ p.ct. Power is to be taken to create special purposes and reserve funds. It is intended to change the name of the Company to the Arlesey and District Gas Company. A standard price of 5s. is proposed, with the terms of the sliding-scale on the usual lines. The remaining clauses are of common form. [*Parliamentary Agents: Messrs. Lees & Co.*]

The British Gas Light Company, Ltd., are applying to the Board of Trade in respect of their Trowbridge station for authority to raise £32,000 in addition to the £50,253 already authorized to be expended under the Order of 1880. It is proposed that of the £32,000, £24,000 and no more may be expended out of the capital stock, and the balance of £8000 is to be borrowed. Out of the profits, not more than 7½ p.ct. is to be divided in respect of the ordinary capital, 6 p.ct. in respect of the part issued as preference capital, and interest not exceeding 6 p.ct. is to be paid on the borrowed money. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

The Garw and Ogmore Gas Company are contemplating the novel course of basing variations of the standard price of gas on the price of coal. They first ask for the repeal of section 30 of their Act of 1908; and then follow these proposals:

In any half year in which the average price paid by the undertakers per ton of coal delivered at the siding of the undertakers does not exceed 15s., the standard price shall be 4s. 6d. per 1000 c.ft., and

In any half year in which the average price paid per ton of coal as aforesaid exceeds the price of 15s., the said standard price of 4s. 6d. per 1000 c.ft. shall be increased by 6d. per 1000 c.ft. in respect of every 2s. or any part thereof, by which the price paid per ton of coal as aforesaid exceeds the said price of 15s.

The variations of the dividend under the sliding-scale per penny increase or decrease in the price of gas are to be, in respect of any half year, 2s. 6d. p.ct. on the ordinary capital with a 10 p.ct. standard rate of dividend, 1s. 9d. on that with a 7 p.ct. dividend, and 1s. 3d. on that with a 5 p.ct. dividend. Power is to be taken to create a reserve fund. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Hoylake and West Kirby Gas and Water Company are seeking an extension of their limits of gas and water supply. The remaining provisions deal entirely with the supply of water. [*Parliamentary Agents: Messrs. Torr, Durnford, & Co.*]

The Llandrindod Wells Gas Company are asking that they may create and issue as preference shares entitled to a dividend not exceeding 7 p.ct. per annum the sum of £5000, being a portion of their authorized capital of £15,000 remaining unissued. In addition to the original capital as defined or authorized by the Act of 1907, they ask for power to raise futher sums not exceeding £6000 as ordinary shares or stock or preference shares or stock, with one-third borrowing powers. In respect of the original capital of £15,000, the dividend is limited to 10 p.ct. and on the new capital it is proposed that it should be 7 p.ct. In addition to the debenture stock powers, the Company ask for power to issue any authorized preference shares or stock or debenture stock as redeemable. Special purposes and reserve funds are proposed. The standard price of gas is placed at 4s. 6d. per 1000 c.ft. The remaining clauses are of ordinary form. [*Parliamentary Agents: Messrs. Lees & Co.*]

The Sheffield Gas Company describe in their Order lands upon which they wish to construct additional works. They also desire powers to purchase by agreement further lands not exceeding 50 acres. As to the supply of coke-oven gas, it is provided that, if any local authority or company supplying gas in any parish outside the limits of supply in which the Company shall have laid mains under the provisions of section 36 of the Act of 1917, shall request the Company to supply them with coke-oven gas, they may do so, and permit the connection of the necessary pipes and apparatus with their mains. But this authority is not to be exercised unless a sufficiency of coke-oven gas remains for distribution within the limits of supply. It is further provided that the price to be paid by any such authority or company for any coke-oven gas supplied to them shall not exceed the price paid to the Company for coke-oven gas supplied in similar quantities and under similar conditions within the limits of suppiy. There also appears a clause intended to reverse the strange decision of a Commons Committee last session. It provides that nothing in sections 36 and 38 of the Act of 1917 shall be deemed to restrict the Company from supplying coke-oven gas for lighting purposes, or the use for such purposes of coke-oven gas so supplied, if it is of the calorific power, and is supplied at the pressure prescribed by the Sheffield [Standard of Calorific Power] Order, 1916, or any amendment or re-enactment thereof for the time being in force, and complies with the provisions as to purity prescribed by the Gas-Works Clauses Act, 1871. Notwithstanding anything in sub-section (2) of section 36 of the Act of 1917 to the contrary, any coke-oven gas supplied by the Company for lighting purposes may be tested in like manner as other gas supplied by them for such purposes may for the time being be tested. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Stirling Gas Light Company desire authority to alter the method of paying dividends with respect to the price of gas during the war and a period after. They propose that the profits to be divided among the shareholders in any year from May 15, 1918, during the continuance of the war and a period of two years thereafter, shall, irrespective of the price charged for gas, be at either the following rates, whichever shall be the greater: Either at the standard rates of dividend payable under the Act of 1898 and the Order of 1904, or at the rates of dividend payable under the sliding-scale in the Order of 1904, *plus* 80 p.ct. of the difference between such reduced dividends payable under the sliding-scale and the rates of dividend paid in the year immediately preceding the war. [*Parliamentary Agents: Messrs. Robertson & Co.*]

ELECTRIC POWER BILLS.

There are three Electric Supply Bills in which the gas industry will be particularly interested, owing to the proposals to introduce coal carbonization as a preliminary to electricity generation. The Bills are being promoted by the County of London Electric Supply Company, the Gloucestershire Electric Power Company, and the Shropshire, Worcestershire, and Staffordshire Electric Power Company. Reference to the proposals was made in the "JOURNAL" for Jan. 1 [p. 12].

Welding Gas-Tubes.

According to "Licht und Lampe" (quoted by the "Ironmonger") a long-distance gas-main laid in connection with the Zürich Gas-Works has been joined by welding the steel tubes into long lengths. The tubes were of 120 and 150 mm. diameter; and each unit was from 10 to 12 metres long. They were placed along the edge of the trench dug to receive them, and there welded together by the oxy-acetylene process to form lengths of from 100 to 150 metres. The process is only recommended for long and fairly straight runs; but its employment in such circumstances is said to save 25 p.ct. of the cost of laying mains.

SOUTH METROPOLITAN GAS COMPANY.

Directors' Report and Accounts.

THE following is the report of the Directors of the South Metropolitan Gas Company for the six months ended Dec. 31, which, with the accounts (an abstract of which appears below), will be presented to the proprietors at the half-yearly meeting on Wednesday of next week.

The half-year's working, after providing for debenture interest and other charges, shows a surplus of £80,103; and in order to pay the sliding-scale dividend of 4 p.ct. per annum, it will be necessary to draw upon the reserve fund to the extent of £56,261. In other words, the profits only provide a return of £2 7s. p.ct. on the ordinary stock. Two causes have contributed to this unsatisfactory result. Firstly, the action of the authorities in raising the price of coal by £32,000 over and above the contracts which had been entered into; and, secondly, a rise of over £20,000 in labour charges beyond that estimated. When the increase to 3s. 1d. in the price of gas was determined upon at Midsummer, these disturbing factors were not provided for; nor does the further increase to the current rate of 3s. 7d. allow any margin of working.

The financial control of the undertaking has for all practical purposes passed from the hands of the Board to those of the Government, who settle the prices of residual products as well as raw materials, and fix scales of wages which, possibly justifiable in the flood-tide of prosperity, appear out of place when associated with the critical period through which the country is passing. Under these circumstances, it seems bare justice that the control exercised by the State should be so extended as to provide a moderate return upon the capital invested in a business so essential to the community as gas supply.

The Bill to be submitted for consideration by the shareholders at the extraordinary general meeting proposes to substitute 3s. 7d. for 3s. 1d. as the standard price for gas during the prevalence of war conditions. The dividend payable with the present price of gas would then be £4 p.ct. It is also proposed to increase the capital powers of the Company (now exhausted) by the sum of £1,500,000.

The demand for gas continues to be satisfactory; the increase in the sales for the half year being 7·35 p.ct., which exceeds all previous records for the corresponding periods. The heavy consumption was not unattended with anxiety; and credit is due to the staff for the steps taken to meet it, in which they have had the loyal assistance of the employees, among whom are included over 2000 female workers.

For the first time co-partnership does not figure in the working expenses. It is hoped that the day may not be distant when a charge under this head will re-appear. Meanwhile, its spirit is being jealously safeguarded by the staff of all grades.

Two Directors (Mr. John Ewart and Mr. E. Honoratus Lloyd, K.C.) and one Auditor (Mr. Charles Mortimer) retire by rotation. They are eligible, and offer themselves for re-election.

CHARLES CARPENTER, *Chairman.*

709, *Old Kent Road, S.E.* 15, *Jan.* 30, 1918.

The Accounts.

The following are the principal portions of the accounts accompanying the report.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 p.ct. is payable on £6,011,224 and £598,671 (Act of 1901, as amended by the Act of 1916) of stock. The amount of 5 p.ct. preference stock (including premiums) under the 1916 Act is £250,000. The loan capital account shows that the loan capital, the rate of interest on which is 3 p.ct., amounts to £1,798,994 and £96,451 (Act of 1901, as amended by the Act of 1916). The amount, at 5 p.ct., under the Act of 1916 is £500,000. The third statement is the capital account. It stands as follows: Amount received, £6,211,816; nominal amount added by conversion (less premium), £3,043,524—total, £9,255,340. The items of expenditure are as follows:

Capital account to June 30, 1917		£5,463,064 14 11
Expenditure during half year to Dec. 31, 1917—viz.:		
New buildings and machinery	£9,990 16 8	
New and additional mains and services	3,633 14 0	
New and additional meters	4,850 0 6	
New and additional stoves	12,087 6 5	
		30,561 17 7
Total expenditure		£5,493,626 12 6
Balance		718,189 13 9
		£6,211,816 6 3
Nominal amount added by conversion, less premium		3,043,523 13 9
Total		£9,255,340 0 0

The net revenue account shows a sum of £80,103 applicable to dividend on the ordinary stock. The balances of the reserve, renewal, and insurance funds stood as follows on Dec. 31 last: Reserve fund, £199,001; renewal fund, £29,036; insurance fund, £81,065.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £399,385; coke and breeze, £43,051; tar, ammonia, and products, £189,354; and sundry plant and stores, £308,837. The figures this time last year were: Coal, £166,348; coke and breeze, £40,725; tar, ammonia, and products, £138,948; and sundry plant and stores, £280,879. A sum of £66,078, co-partnership bonuses and savings, has been deposited with the Company; and the total of the superannuation and guarantee funds is £144,828. The figures last year were £74,039 and £116,926.

The following is the revenue account.

REVENUE ACCOUNT—*Expenditure.*

Manufacture of gas—			
Coal into store, including £3985 8s. 10d. for London Port and tonnage dues	£910,712 16 8		
Purification	20,332 9 1		
Salaries of Engineer and Officers at works	21,823 10 2		
Wages (carbonizing)	77,743 12 0		
Repairs and maintenance of works and plant, less £7095 8s. 6d. received for old materials	191,882 16 7		
		£1,232,495 4 6	
Co-partnership		..	
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes	£31,396 16 6		
Salaries and wages of officers, including rental clerks	29,460 16 11		
Repair and renewals of meters	31,652 0 8		
Repair and renewals of stoves	20,788 18 6		
Repair and renewals of gas-fittings	27,147 15 7		
		140,446 8 2	
Public lamps, labour and materials £19,792 6s. 4d., less £13,639 5s. 7d. received for the same		6,153 0 9	
Rents, rates, and taxes—			
Rents payable	£1,541 10 10		
Rates and taxes	43,978 4 5		
		45,519 15 3	
Management—			
Directors' allowance	£3,352 7 6		
Salaries of Secretary, Accountant, and clerks	4,454 0 9		
Collectors { Ordinary	6,661 15 10		
Collectors { Slot meter	17,675 13 5		
Stationery and printing	5,367 4 10		
General charges	13,288 10 8		
Company's Auditors	112 10 0		
		50,915 3 0	
Miscellaneous—			
Law charges		189 15 11	
Parliamentary charges		625 0 0	
Bad debts		894 7 1	
Stolen from 329 slot meters broken open		167 3 2	
Superannuation, sick, and accident funds		14,727 4 1	
National Insurance Act charges		4,541 15 11	
Gas Referees and Official Auditor		245 6 6	
Leasehold renewal fund		1,000 0 0	
War Fund		7,264 7 8	
Total expenditure		£1,505,184 12 0	
Balance carried to net revenue account		146,509 3 11	
		£1,651,693 15 11	

Receipts.

Sale of gas—			
Michaelmas at 3s. 1d. per 1000 c.ft.	£181,005 3 6		
Christmas at 3s. 1d. per 1000 c.ft.	600,261 17 10		
	£981,267 1 4		
Public lighting	14,855 10 10		
		996,122 12 2	
Meters at rent	£55,783 18 2		
Stoves and fires at rent	40,254 15 1		
Gas-fittings at rent	30,777 3 7		
		126,815 16 10	
Residual products—			
Coke, less labour and cartage	£357,525 7 7		
Breeze, " "	3020 15 1		
Tar and tar products, less labour	91,464 15 10		
Ammonia and products " "	75,204 3 1		
		527,215 1 7	
Rents receivable		1,462 7 10	
Transfer fees		77 17 6	
Total receipts		£1,651,693 15 11	

Total amount paid in salaries for half year, £49,259 17s. 3d.
" " " wages " £502,626 12s. 2d.

Statement of Coal.

In Store June 30, 1917.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1917.
Tons. 310,530	Tons. 559,186	Tons. 604,786	Tons. 1804	Tons. 263,126

Statement of Residual Products.

Description.	In Store June 30, 1917.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1917.
Coke—tons	29,902	372,344	67,540	297,129	37,577
Breeze—tons	13,618	58,455	29,492	34,045	8,536
Tar—gallons	503,077	5,729,652	5,624,675	..	608,054
Ammoniacal liquor—butts	7,279	217,976	214,545	..	10,710

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 7,450,061	Thousands. 128,151	Thousands. 6,615,401	Thousands. 6,859,166	24,923

The visit of the Scottish Junior Gas Association (Eastern District) to Forfar, which had been arranged to take place next Saturday, has been postponed until a later date. This decision has been come to by the Council, with the concurrence of Mr. T. W. Harper (the Forfar Gas Engineer), consequent on difficulty in the train service.

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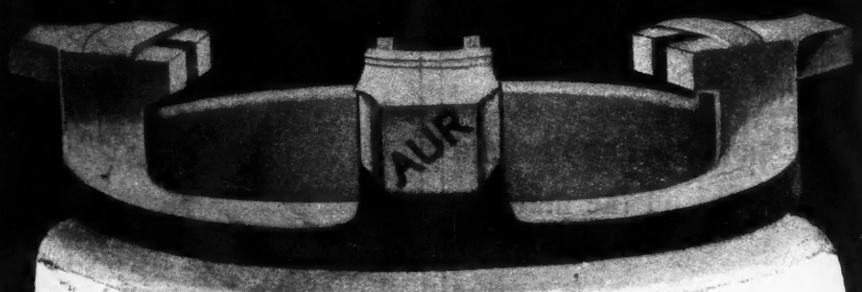

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COMMERCIAL GAS COMPANY.

Half-Yearly Report.

THE following is the report for the six months ended Dec. 31, which the Directors of the Commercial Gas Company will present at the meeting of shareholders on Thursday of next week.

The Directors submit the accounts for the half year ended Dec. 31, 1917. The revenue account shows a net profit for the half year of £35,538, which, added to the balance of £60,353 brought forward from the previous half year, produces a net revenue balance of £95,891. Deducting therefrom £14,248 for interest, there remains standing to the credit of the net revenue account a balance of £81,643 available for dividend.

The Directors recommend the payment of the statutory dividends thereout, at the rates of £4 2s. 8d. p.ct. per annum on the 4 p.ct. stock of the Company, and of £3 13s. 4d. p.ct. per annum upon the 3½ p.ct. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year.

The Directors have resolved to promote a Bill in Parliament to authorize the Company to raise additional capital, and for other purposes. The Bill will be submitted for the approval of the proprietors at an extraordinary meeting to be held immediately after the close of the ordinary meeting.

Owing to the increase in the cost of coal and other raw materials, and the extra payments to the Company's workmen by reason of the war, the Directors found it necessary to increase the price of gas from 3s. to 3s. 2d. per 1000 c.ft., as from the taking of the meter-indices at the Midsummer quarter, and to make a further increase from 3s. 2d. to 3s. 6d. per 1000 c.ft., as from the Christmas quarter.

Mr. H. E. Jones and Sir Frederick Green, two of the Directors, retire by rotation, and, being eligible, offer themselves for re-election. Mr. B. W. Ellis, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

WILLIAM GRAHAM BRADSHAW, *Chairman.*

Gas-Works, Stepney, Jan. 30, 1918.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on Dec. 31 last amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £149,298 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed at this date was £339,062 10s., and £135,937 10s. was added by conversion, making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The capital account receipts amount, with premiums, to £2,606,065. The expenditure stands at £1,525,522, with a nominal amount of £1,212,812 added by conversion—together £2,738,334. There is thus a balance of £132,269 carried to the balance-sheet. A sum of £3749 was during the half year expended on new and additional buildings, plant, &c., and £73 on new and additional mains and services. But £12,183 is credited for steamships, stoves, and prepayment meters and fittings. The reserve fund amounted at the close of the half year to £42,471, and the insurance fund to £28,339.

The following is the revenue account:

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£234,886 19 5		
Salaries of Engineer and officers at works	3,362 4 4		
Wages (carbonizing)	15,922 11 2		
Purification, including labour	1,357 19 7		
Repair and maintenance of works and plant, materials and labour (less £1412 13s. received for old materials)	34,351 10 7		
		£289,881 5 1	
Profit sharing		1,475 1 4	
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£7,763 8 5		
Repair, maintenance, and renewal of mains and services, material and labour	8,310 14 6		
Repair and renewal of meters	3,000 14 0		
" " " " stoves	12,789 15 6		
" " " " prepayment meters and fittings	13,226 0 9		
Maintenance of mantles and fittings	1,459 7 2		
		46,550 0 4	
Public lamps—lighting and repairing		3,385 5 3	
Rent, rates, and taxes		17,462 3 8	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and clerks	1,264 16 0		
Collectors' salaries and commission	1,812 13 8		
Prepayment meter collection	5,557 8 8		
Stationery and printing	1,555 4 3		
General charges	2,349 2 5		
		13,864 5 0	
Bad debts		326 12 3	
Law and parliamentary charges		134 7 2	
Superannuations and allowances and Workmen's Benefit Society, &c.		2,793 13 7	
Official officers, &c.		94 5 0	
National Health and Unemployment Insurance		602 9 9	
Allowances to employees on active service		3,693 7 7	
Total expenditure		£380,263 16 0	
Balance carried to net revenue account		35,537 17 0	
		£415,801 13 0	

Receipts.

Sale of gas—			
Per meter (number in use, 116,220) at 3s. 2d. per 1000 cubic feet	£274,767 0 6		
Public lighting and under contracts	4,936 15 2		
	£279,703 15 8		
Less discounts and allowances	15,109 19 0		
		£264,593 16 8	
Rental—			
Meters (24,407)	£3,082 18 5		
Stoves (88,268)	14,357 8 0		
Prepayment meters and fittings (91,164)	17,766 3 1		
Maintenance of mantles and fittings	760 13 2		
		35,967 2 8	
Residual products—			
Coke, less £6247 12s. 6d. for labour	£78,160 1 8		
Breeze, less £1693 15s. 2d. for labour	795 1 0		
Tar	19,956 13 11		
Ammoniacal liquor and products, sulphuric acid, &c.	16,299 2 1		
		115,210 18 8	
Miscellaneous receipts—			
Rent receivable	0 10 0		
Transfer fees	29 5 0		
		29 15 0	
Total receipts		£415,801 13 0	

Statement of Coal and Oil.

—	In Store June 30, 1917.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1917.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	43,472	108,823	113,125	526	38,644
Oil—gallons	628,369	410,570	522,749	..	516,190

Statement of Residual Products.

Description.	In Store June 30, 1917.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1917.
Coke—tons	5,211	73,531	10,422	64,510	3,810
Breeze—tons	5,918	8,529	..	9,076	5,371
Tar—gallons	535,532	1,247,251	..	1,151,916	630,867
Ammoniacal liquor—butts of 108 gallons	12,475	37,021	36,363	2,679	10,454
Sulphate of ammonia—tons	26	..	..	22	4

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,975,954	25,818	1,744,554	1,800,011	3801

The last statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £103,306; coke and breeze, £5264; tar, ammoniacal liquor and products, sulphuric acid, &c., £17,147; sundry stores. £59,511—total, £185,228. The figures this time last year were: Coal, oil, &c., £48,080; coke and breeze, £7465; tar, ammoniacal liquor, sulphate of ammonia, &c., £14,946; sundry stores, £47,096—total, £117,589.

A Government Experimental Station in the United States.—The United States Bureau of Mines have decided to establish an experimental station in the heart of the great mid-continent oil and gas fields at Bartlesville (Okla.), for the investigation of problems having commercial application to the petroleum industry—such as questions of production, transport, storage, and refining—and to the technology of natural gas. The citizens have offered to give a free site, and have raised £10,000 towards the expenses of building offices and laboratories, and the purchase of engineering and chemical equipment. Basic elementary facts are lacking in many phases of these industries; and investigations may be carried on that are not of themselves directly practical, but which will provide knowledge on which commercial results of tremendous importance may be founded.

The Estimation of Phenol.—Dealing fully, in the pages of the American "Journal of Industrial and Engineering Chemistry," with the determination of phenol in the presence of the three cresols, Messrs. Knight, Lincoln, Formanek, and Follett describe a feasible method which not only obviates the necessity of referring to a plot in calculating results, but gives concordant and reliable results with all the different combinations and percentages of the different cresols and phenol likely to be met with in commercial practice. In addition, the method is not dependent for its accuracy on the purity of the particular *o*-cresol used by the investigators for the derivation of their formula for calculating the percentage of phenol. In applying the principle involved to the practical determination of phenol in crude commercial tar acids, suitable provision is made for the complete separation of the small amounts of hydrocarbons that are usually present in crude cresylic acids, especially those made from blast-furnace tar, which would otherwise introduce serious error. A new still-head, especially designed for this kind of work, is used for the more complete and satisfactory removal of the xynols and higher homologues.

ELECTRICITY SUPPLY MEMORANDA.

In its review of electrical engineering in 1917, "The Times Engineering Supplement" has not much to announce in the way of progress; but it sees in the events of the year considerable grounds for anticipating reform which will result in a new standard of generating efficiency, and therefore of general economy. The Electrical Correspondent of "The Times" has throughout his references to the subject of the trend of generating reformation in the electricity industry been an advocate of large centralization of generating plant, and a hard hitter at the parochialism which he finds obsessing local authorities, and which, in his view, stands in the way of progress in the direction he thinks the proper one. Whether he is responsible for the electrical engineering part of the review we cannot say; but, if so, with the dawn of a new year, he has apparently come to the conclusion that centralization or the super-station has its limitations—at any rate, he finds his position assailed by new considerations. In glancing over the situation that developed during last year, he finds that, though there may be differences of opinion as to the method of control and many details, the balance of opinion is in favour of concentrating the work of generation in a comparatively few stations, which could be equipped with larger units than have yet been installed, although in some of the projected extensions of existing or contemplated new stations—notably the Barton station of the Manchester Corporation—the intention is to instal generating sets of high capacity. And then we come to this remark: Apparently, however, the last word has not been said on this subject, as a new station put in service during the year, in which 4000 KW. sets are used, is held by some to indicate that stations of 12,000 to 16,000 KW. can be erected to produce electric current at such a low cost that there is little or no additional economy in further increasing capacity, or at least not such as would balance the additional cost of the larger transmission systems. This is a healthy admission, as it shows that consideration is now being given to the question of whether concentration cannot be carried to uneconomical lengths.

Limitations to Economy from Centralization.

The much-cherished notion that carbonization of coal should be the prelude on independent lines to electricity generation is receiving a hearty shaking from those engineers who look at the matter fairly and squarely, which indicates an improvement in their education. Take, as an example, Mr. R. A. Chattock, the Electrical Engineer of Birmingham. He has expressed the opinion that at the present time a great expenditure in this direction would not be justified. He goes further, and urges those who are entertaining visions of the electrical industry becoming carbonizers of coal not to forget that what might be best from the national point of view might not be best from the point of view of the industry. But the national point of view must always take precedence of the individual point of view. And we would therefore suggest to Mr. Chattock that perhaps some other course than that of the carbonization of coal by the electricity industry might be taken which would serve both the national and the industry's interests. If so, then it is the obvious duty of the electricity industry to encourage this course. One of the grounds for Mr. Chattock's doubt is that, in view of the enormous business organization to handle—perhaps, eight times—the quantity of coal now required to generate a given amount of electricity, and to treat bye-products, the present business of electric supply might become almost an offshoot of the larger organizations, with the danger that the interests of the supply customers may be jeopardized by the possible failure of one or more of the other branches. We do not know on what ground Mr. Chattock suggests that it would be necessary to handle eight times more coal than now to generate a given quantity of electricity; seeing that the carbonizing methods of the gas industry produce per ton of coal approximately half-a-ton of coke for sale with a net evaporative value quite equal to coal, and having advantages about it, given proper treatment, that coal does not possess. This is without reference to the calorific value of the gas produced. However, on the coke basis alone, one cannot see whence Mr. Chattock derives his eight times the amount of coal for a given output of current. There is no reason why, in time, the electricity supply industry should handle coal at all, inasmuch as the output of town gas is bound to increase enormously for heating purposes—domestic and industrial, and, with this increase, the output of coke. Where, then, in the national interests is there any reason for the electricity industry to undertake the work of coal carbonization to give them the fuel, denuded of material of national value, which can be provided by the gas industry? National economy does not include superfluous work.

Coal Carbonization and Coke Supply.

That knowledge of these matters is growing is seen by certain communications in "The Times Engineering Supplement." The would-be electrical carbonizers of coal must not be allowed to make unnecessarily further inroads upon the coal supply, and produce commodities in excess of the demand. It is being recognized that this is not the way to national and industrial economy. The most rapid line of development, as one of the correspondents of our contemporary points out, would be by giving both gas and electricity supply authorities facilities and assistance for side to side development and extension. Very considerable economies, he submits, could be effected by utilizing to the utmost extent the redundant capacity of existing bye-product plant and coal-handling equipment at gas-works situated in large industrial centres, and by the co-ordination of the gas and electricity supply systems. Through the independent and divergent lines of development that have been pursued, the real allied character of the two industries has been completely obscured by stupid antipathy, which excludes the possibility of co-operation and joint development on mutually beneficial lines. Common to both industries is a pressing need for adequate outlets for surplus productive capacity; and the writer holds that the complete satisfaction of this primary condition of efficiency must remain a factor of decisive importance. Of gas coke there is a production that normally gives a surplus, and which surplus will increase, without steps are taken to promote its absorption by arresting the use as far as possible of raw coal; and the direct use of coke as fuel in the generation of electricity on a large scale has proved the utility of this the most important of all the bye-products of gas manufacture. On the other hand, the gas industry, it is suggested, offers scope to the electricity industry for the improvement of its load factor. The adaptability of certain electro-thermic and electro-chemical processes to off-peak conditions of working opens up enormous possibilities; and the writer in our contemporary indicates that these possibilities include the working-up by means of electrical processes of secondary products of gas manufacture hitherto sold in the crude state. The writer, it is evident, is out for reciprocal business relations; but the hope in this direction must not be too strongly based, as the future plans of the gas industry have not yet sufficiently matured for any positive determination as to what will happen. Everything points to some large developments in the bye-product line; but the question of the source of power must be decided by the relative cost of home production and outside purchase.

Reciprocal Relations.

Another point made by the author of the article is that the employment of one instead of two coal-buying organizations, which would be a result of co-operation, would very properly tend to eliminate competition in securing supplies. It would certainly tend to economy in transport and in handling, if nothing else, as history shows that there is such a thing as the frustration of the best-laid schemes of buyers by "understandings" and agreements between sellers. The argument in favour of a co-operation that should lead to joint economy and development is advanced into other considerations. For instance, the writer points to the large quantities of waste heat available in utilizable form at most gas-works. There are the waste gases from the retort flues which might be used for feed-water heating, and the sensible heat of the incandescent coke might also be utilized for steam-raising as part of it is now employed as required for heating retort-settings, which, of course, would mean the utilization of steam-boilers and generators in close proximity to retort-houses. The gas engineer may fairly boast of the high thermal efficiency of his process, taking into account the thermal value of the secondary products. But the gas engineer, given the opportunity, can do yet more in recovering waste heat; and it is this opportunity that the contributor to our contemporary desires shall be realized by the sensible course of linking-up a fuel supplying industry with an industry requiring fuel for generating steam, and which industry, given satisfactory fuel for the purpose, has no excuse for saddling itself with a cumbrous scheme involving a huge capital outlay for carbonizing an additional quantity of coal beyond what is necessary, making due allowance for the future development of the gas industry. [In this connection, an article in another column on the use of coke in large-scale steam-raising operations will prove of interest. See next page.]

Unused Economies.

Many electricity undertakings, like gas undertakings, have overrun their power of production and supply. The former are not in such a good position as gas-works for meeting loads in excess of generating capacity. The enormous advantage gas-works possess in storage has no equivalent in electricity practice; but, even so, there are some gas undertakings that, owing to the demand that has arisen for gas during the war, combined with the difficulties occasioned by the shrinkage of labour and the indifferent quality of the coal supplied, have had to call upon their ordinary consumers to study economical use, in order that munitions works' requirements for light, heat, and power may not suffer. This being the experience in connection with gas-works with their superior advantages, it is not surprising to find electricity works much worse off. They, too, in industrial areas, have had large draughts upon them for electric energy for munitions work; they, too, suffer from an indifferent supply of fuel, which increases labour in steam-raising and reduces the efficiency of boilers; and they, too, are affected by the restrictions as to capital expenditure for extension, and the impossibility of securing men and materials for adequate repair and maintenance. A number of electricity undertakings have, in consequence, had to appeal to their consumers to economize, and in some cases to limit the use of appliances during the peak-load hours of the day. But when this limitation of use

Current Supply Difficulties.

is made compulsory upon manufacturers, it means not only loss and inconvenience to them, but also to their workpeople. For example at Derby, there have been frequent interruptions of the electricity supply; and lately the Ministry of Munitions gave instructions that the supply of electricity to certain works should be increased. To enable this to be done, manufacturers who use motors, and are not engaged on war work, have been requested to stop them for two hours in the afternoon. Tradesmen have also been asked to cease using electricity for illuminating shop windows. The general public are to share in the inconvenience by the curtailment of the tramcar service; and this will, of course, mean a sacrifice of revenue by the tramways department. Take Finchley as an example in connection with domestic service. The Ministry of Munitions has, in this instance, authorized the disconnection of electric heating and cooking apparatus, owing to the heavy tax on machinery at the generating station. But probably such a drastic measure will not be taken, if consumers voluntarily economize, as we see that the Electricity Committee have decided to occasion as little inconvenience as possible by requesting consumers not to use this type of apparatus during certain specified hours. We have no doubt they will willingly comply, if electricity used for heating and "cooking" is being charged for at anything like 2d. per 3420 B.Th.U., as is the case in some places.

GAS COKE AND LARGE-SCALE STEAM-RAISING.

Successful Trials, and the Importance of the Results.

As our "Electricity Supply Memoranda" this week mentions, electrical engineers are now turning their attention much more than formerly to the question of the employment of coke for steam-raising on a large scale. For relatively small steam-boiler plants, with hand-firing, gas coke has been used for many years. Success with such plants has been largely due to the continued incandescence of the fuel over the whole grate area, which gives the preliminary ignition that is essential to the combustion of the coke. Attempts to burn gas coke exclusively, as distinct from coke breeze, on mechanically driven grates have not been so successful—difficulties being met with that do not accompany coke breeze. However, we hear of large trials having recently been made which are tending to demonstrate that the ordinary run of coke from horizontal and inclined retorts, broken down to what is known as the London Coke Committee's No. 2 Grade—¾ in. to 2-in. cube, including the small—can be used with success under ordinary water-tube boilers on mechanically operated travelling or chain grate stokers.

Some Considerations, but Ultimate Economy.

The question of easy ignition is not the only one, though the one of main importance, that has to be considered by the user of large steam-boiler plants. There is the possibility that, after the capital expenditure necessary for using coke has been incurred, the difference in values between coke and coal might not in future be sufficient to justify the outlay. The answer to any such submission is that, if a mechanical stoker or furnace can be constructed to burn ordinary gas coke (which is as nearly pure carbon as any fuel), the same stoker can be adapted to any low-grade fuel on the market. A second consideration may be the increased wear and tear found in unloading barges by means of existing grabs as compared with coal. This can be met by debiting the coke with the cost of teeth for the grab jaws, and with the lower rate of discharge. Then there is the question of the acceptance of ungraded coke as it comes from the retorts; so saving crushing and extra handling at the gas-works. This can also be met by debiting the coke with the cost of crushing in an existing coal-breaker such as is now usually installed in large power stations, or alternatively debiting the coke with the cost of new coke cutters. In respect of equal thermal value, greater bunker capacity is required for coke than coal. This is seen by a comparison of the approximate space occupied by the two fuels:

	Approximate Space Occupied.
Ungraded coke	90 c.ft. per ton
Broken coke	75 ,, ,,
Coke breeze	60 ,, ,,
Washed nut coal	48 ,, ,,

This disadvantage is easily met by contracting for coke with the local gas supply authority, who can undertake to keep an adequate stock of either coal or coke on the works, and by further debiting the cost of the coke with the interest on the increased capital value of the bunkers and coal-handling plant. Again, coke has a high angle of rest (about 40°); and so it may be expected that difficulty will be experienced with the hanging-up of the coke in the bunkers. This, in the trials already referred to, has not been altogether realized. But, anyway, the additional labour that may be involved by trimming can be debited to the coke. As to ash, experience in the trials has also shown that the weight from coke is not any greater than that from the coal then in use—about 8 to 10 p.ct. Regarding the point as to the relatively lower calorific power of coke, the same experiments have established that a safe figure to allow for the difference in the value of the coke as fired, and that of the bituminous coal in use, would not really exceed 1000 B.Th.U. The calorific power of quenched gas coke as fired varies from 11,500 to 12,000 B.Th.U. per pound.

These considerations notwithstanding, it has been made clear by this large-scale investigation that, besides a substantial economy in coal consumption and transport, there is considerable financial saving in the use of locally produced coke—a saving, in fact, which will liquidate the cost of the new plant in from three to four years.

Expression of Confidence in Result of the Trials.

That confidence was engendered by the trials, taking into account the disadvantages and the manner of dealing with them, is shown by the fact that an order has been placed for the equipment of eight boilers of the Stirling and Babcock types, with the Underfeed Stoker Company's travelling grate stokers, capable of using 200 tons of coke per day. The heating surface of the Stirling boilers, including the superheater, is 3650 sq. ft.; and the effective area of the two grates fitted per boiler is 100 sq. ft. Therefore, the surface ratio allowed is as 1 to 36·5, which has proved sufficient to give ample overload capacity. The ignition arch first constructed was a plain inclined type, rising from a height of 10 in. at the front to 2 ft. 6 in. at the rear end of the furnace in a length of 9 ft. To carry off the products of combustion without risk of the fumes being forced into the boiler-house, the natural chimney draught available—¼ in. to ⅜ in. at the boiler damper—has proved to be sufficient.

A Simple Expedient Establishes Success.

Difficulty was experienced, when first the plant was brought into operation some months ago, in maintaining satisfactorily the preliminary ignition of the fuel as it entered the furnace. But this was overcome by adopting a definite counterflow arrangement of hot gases relative to the incoming fuel. With this simple but effective modification, and a slight variation in the furnace settings, the successful burning of ordinary high-temperature coke for steam-raising on a relatively large scale has been fully established. With a fire thickness of about 9 in. to 10 in., and a forced draught of 8-10ths to 9-10ths of an inch applied under the fuel bed about 18 in. from the coke-feeding hopper, and graduated to zero towards the back end of the grate, a good even-burning incandescent fire can be obtained while a high proportion of carbonic acid (ranging from 11 to 13 p.ct.) is maintained in the flue gases.

A Matter of National Importance.

Many engineers are now looking forward to the results of evaporative tests which will be made in the near future. Whatever the nature of the results then obtained, it is not suggested that the final form of furnace or grate for burning gas coke for steam-raising has been reached. But the realized experience supplies the case for further practical research. This is a national question. The proof that gas coke can be burned successfully under large capacity steam-boilers by mechanical means places the economical utilization of the nation's fuel resources in a more satisfactory position than ever before. Under a comprehensive scheme of fuel and power supply to a large community, bituminous coal can be carbonized at existing gas-works, the bye-products be recovered, and the coke be utilized for the generation of electricity. So much, however, depends upon the efficient burning of coke for large-scale steam-raising; and this is the direction in which to press forward so as to achieve the ultimate welding of the interests of the gas industry as fuel suppliers and of the electricity industry as fuel users. In this lies the importance of the results of the trials to which allusion is made in this article.

Gas Installation in a Cough Drop Factory.

In a new factory at Poughkeepsie (N.Y.), designed for the conducting of large-scale operations, the time-honoured use of coal for cooking "candy," or cough drop mixture, has been superseded by gas. Five continuous cookers, and six gas-fired steam-boilers of different sizes, aggregating a rated capacity of 106 boiler horse power, have been installed. In referring to the matter, the "Bulletin of the National Commercial Gas Association of America" points out that the continuous cooker consists of a heavy pan-shaped base on which is mounted a cooker-dome, consisting of a cylindrical jacket surrounding a copper coil. The mixture is cooked to a temperature of 234° Fahr. in steam-jacketed melting-kettles, connected to the coil in the cooking-dome. A feed-pump draws the mixture off through a valve beneath the melting-kettle, and up into the cooking-coil, which is surrounded by live steam at about 90 lbs. pressure. A vacuum pump at the discharge end of the coil so increases the speed that a batch of mixture passes through the coil in less than a minute. The cooking-coil discharges the mixture into batch-kettles, from which in due course the syrup is dumped into catch-pans, and removed to metal-covered tables. The steam used throughout this process is supplied by the six gas-fired boilers, which operate at a pressure of 100 lbs., and are fully equipped with automatic devices which regulate the flow of gas and the steam pressure developed. A battery of four large meters is provided to measure the gas used, amounting (at approximately 1 c.ft. per pound of candy produced), with the entire plant in operation, to 50,000 c.ft. per working day. It is said that the installation is the largest of its kind in the world. Though arguments for the relatively high efficiency, automatic control, and space and labour saving of the gas-fired installation, all influenced the choice of fuel, it was the cleanliness of the gas steam-boiler, the freedom from dirt and dust incidental to handling coal and ashes, and the ensuring of perfectly sanitary conditions in and about the plant that most appealed to those with whom the decision rested.

ARE COAL BRASSES OF VALUE?

By P. PARRISH.

READING in the "Iron and Coal Trades Review" recently about the utility and increasing value of coal brasses as a raw material in the manufacture of sulphuric acid, it occurred to the writer that a few notes concerning the above would be interesting alike to chemical manufacturers as to chemists and gas engineers.

Firstly, consideration will be given to this question from the point of view of the chemical manufacturer, and subsequently from the gas engineer's standpoint. Coal brasses have been used for forty or fifty years in manufacturing sulphuric acid. More often than not they have been judiciously mixed with iron, or cupreous pyrites; but occasionally they have been exclusively used. The writer several years ago operated a small unit of sulphuric acid plant in which coal brasses were used exclusively. For many years an acid works in the county of Derby has used nothing other than this class of pyrites for the production of sulphuric acid.

In pre-war times it was the custom for men or boys to work at the colliery screens to remove the brasses from the coal. Owing, however, to a trades union edict, singularly small quantities of brasses have been removed from coal recently, as the gas engineer knows to his cost. If the "powers that be" collaborated satisfactorily, they could not fail to form a correct perspective of this important question. The justifiableness of the latter assertion will be more adequately appreciated later.

What standard of quality or what physical characteristics should the coal brasses possess to be of value to the chemical manufacturer? The writer's experience would lead him to formulate some such specification as the following: The coal brasses must contain a minimum of 38 p.ct. of expungeable sulphur. Sulphate of iron should not exceed 6 p.ct. The brasses should be free of adhering coal and "bind;" and the pyrites should preferably be in thick nodules.

Comment on the above specification is, perhaps, desirable, although the necessity of some of the provisions is more or less self-evident. The combustion of sulphurous pyrites, whether iron, cupreous, or carbonaceous, is based on the production of such a temperature as will ensure initial ignition; and afterwards the exothermic heat of reaction must be adequate to afford continuity of the process. If the expungeable sulphur content falls much below the limit imposed, then one experiences difficulty in maintaining combustion; and dislocation of the process of acid manufacture at many varied points ensues in consequence. Freedom of the brasses from sulphate of iron is necessary, owing to the wastefulness in breaking and the bad burning consequent on the presence of an undue quantity of "fines." If one can ensure good round lumps of 2½ to 3 in. cube, little trouble arises in the control of the draught on the burners; but if "smalls" are present and irregularly distributed, then one is obsessed with troubles.

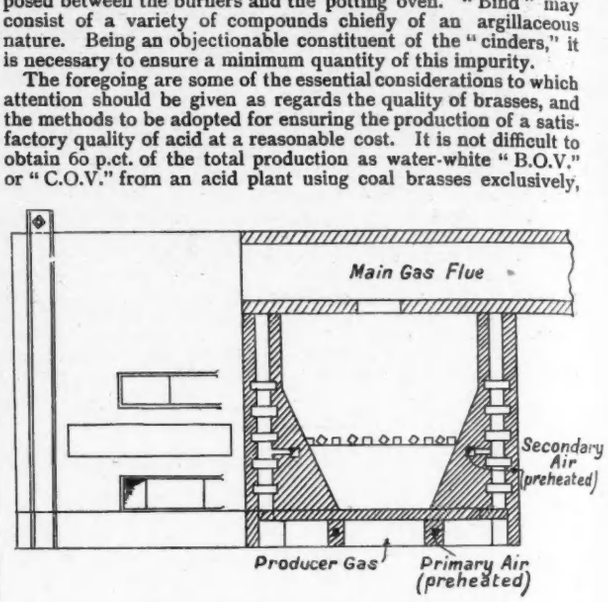
An undue percentage of adhering coal causes the production of CO_2, which is a diluent gas occupying chamber space intended for more advantageous use. To avoid the production of too large a quantity of diluent gas, the tendency is to work with a deficiency of oxygen at the burners, rather than an excess. Under such conditions, imperfect combustion of the carbonaceous matter results; and one finds appreciable quantities of fine carbon particles carried along with the gaseous mixture of SO_2, O_2, N_2, CO_2, &c. This is bound to cause discoloration of the Glover tower acid, as also possibly the acid in the chambers.

The latter obstacles are not insuperable; and plant of an inexpensive nature could be devised for overcoming the difficulties mentioned. The "pit" and the side walls of the burners could be so arranged as to admit of being heated with the producer gas at will. Thus if, by reason of a sudden fall of temperature due to an inferior quality of coal brasses, combustion was inclined to be sluggish, this defect could be readily corrected by the introduction to, and ignition of, producer gas, thereby maintaining in the chequerwork flues of the burners [see the accompanying illustration] the desired temperature.

Filtration through an oxide of iron lump filter (such as is used in the Mannheim type of contact acid plant) of suitable dimensions, well lagged with non-conducting composition, would ensure the elimination of the bulk of the suspended carbon particles which are productive of discoloration. It would then be possible to work with a somewhat restricted supply of air. Under these conditions, while ensuring combustion of the sulphides of iron of the brasses and the necessary oxygen for the process, only part of the carbon would be converted into CO_2; the remainder being carried along with the gases in the shape of dust and fine particles, to be arrested in the filter afterwards. Further, by adopting the above method concurrently with the removal of the dust, the conversion of the SO_2 to SO_3 by catalytic influence of the iron oxide (given suitable temperature conditions) would be promoted, and a less quantity of nitrate of soda would need to be used at the potting oven.

It is known that the reduction of the oxides of nitrogen, by the partially incandescent particles of carbon, to nitrogen or to the lower oxides of nitrogen (such as N_2O, which is useless in the process of sulphuric acid manufacture) occurs. To avoid a high nitrate of soda consumption, the writer would strongly countenance the use of a nitric acid feed on the Glover tower. This method would replace the usual potting of nitrate of soda at the oven on those plants where a suitable dust-chamber is not interposed between the burners and the potting oven. "Bind" may consist of a variety of compounds chiefly of an argillaceous nature. Being an objectionable constituent of the "cinders," it is necessary to ensure a minimum quantity of this impurity.

The foregoing are some of the essential considerations to which attention should be given as regards the quality of brasses, and the methods to be adopted for ensuring the production of a satisfactory quality of acid at a reasonable cost. It is not difficult to obtain 60 p.ct. of the total production as water-white "B.O.V." or "C.O.V." from an acid plant using coal brasses exclusively,



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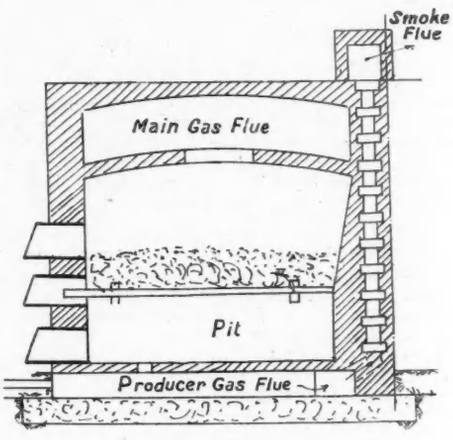

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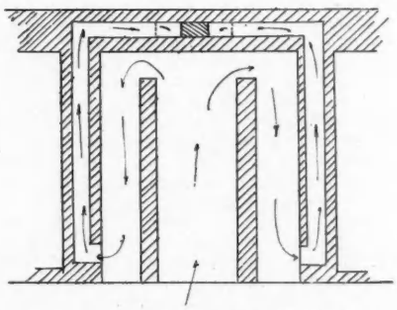


PLAN OF BAFFLE FLUES BENEATH ASH-BIN.

DIAGRAM OF A SCHEME FOR THE APPLICATION OF EXTERNAL HEAT FOR ASSISTING THE COMBUSTION OF LOW-GRADE COAL-BRASS PYRITES.

given efficient control, and provided attention is directed to the above considerations.

The "cinders" resulting from the combustion of the brasses, if suitably treated, are also very valuable, and afford a source of revenue to the chemical manufacturer. The quantity of such cinders produced per ton of coal brasses consumed, naturally depends on a number of considerations. Where the adhering coal and bind are not excessive, and the sulphate of iron content is within the limit suggested, one can safely count on 11 cwt. of cinders per ton of coal brasses burnt.

After cooling the cinders, they are next ground between cast-iron rolls, then treated in a reverberatory furnace with a view to the expulsion of any unconsumed sulphides as SO_2, or the

oxidation of the sulphides to sulphate. The calcined cinders are next washed to remove by dissolution the soluble iron salts, subsequently dried, and levigated to an impalpable powder, exceeding in fineness the specification to which the cement manufacturers conform. Indeed, to suit the paint manufacturers to whom the final material is invariably sold, the iron oxide cannot be too fine. The colour of the final product varies owing to several conceivable conditions.

The final oxide of iron contains 90 p.ct. of Fe_2O_3, and commanded a price of approximately 30s. per ton in pre-war times. That coal brasses of the quality mentioned at the present time are worth at least 10d. per unit of available sulphur per ton seems obvious.

Approaching, now, this subject from the gas engineer's point of view. Coal brasses are most certainly a source of nuisance by reason of the deterioration of the quality of the coke, due to the increased ash content resulting. Further, on carbonization of coal containing this impurity, one increases the quantity of impurities in the shape of H_2S and sulphur compounds. Experimental carbonization of these brasses in the laboratory reveals the fact that there is a large proportion of sulphur compounds (other than H_2S) to sulphuretted hydrogen; and it is evident the costs of purification will be high if previous standards of purity are to be maintained. Moreover, according to the percentage of brasses in the coal to be carbonized, so is the production of tar and ammoniacal liquor correspondingly and adversely affected.

If the latter disabilities under which the gas engineer labours were fully appreciated, and if the utility of this material from a chemical manufacturing point of view were recognized, one can well imagine that the bugbear of the gas engineer would be relegated to the burners of the chemical manufacturer, where the pyrites in question could be treated with advantage and profit. Thus a problem of true national economic importance would be solved.

UNUSUALLY LARGE PRODUCTION OF WATER GAS IN CONTINUOUS VERTICAL RETORTS AT PERNAMBUCO, BRAZIL.

By HENRY M. BALSAM, Engineer of the Pernambuco Tramways and Power Company, Ltd.

PROBABLY never before in the history of the gas industry has a set of vertical retorts been operated to produce a coal and water gas mixture with the water gas constituent running as high as 50 p.ct. This radical modification in retort-house practice was a direct result of the tenseness of the coal situation in the early part of 1917; it having become evident that urgent measures had to be taken to find a suitable substitute for coal or seriously curtail its consumption. It should be noted here that approximately one-third of the total make is generated in carburetted water-gas apparatus; while the balance is produced in the retort-house.

It was not desirable to go back to the old horizontal retorts that we had only recently abandoned in favour of a new set of Glover-West verticals. A plant carbonizing wood will soon show the effects of the acid evolved in the process; and where old horizontals still exist, it would be poor policy to sacrifice a new set of vertical retorts. Wood carbonization is at best an extreme measure; the difficulties and cost of lime purification on a large scale for the high percentage of carbon dioxide making it prohibitive where other means are at all available.

We realized that if we could effect a 50 p.ct. reduction at once in the coal consumed, we would probably tide-over the difficult moment, and for the time being, at least, save the situation. In the circumstances, only one practical plan presented itself, which combined the principal advantage of readiness of execution with that of a minimum expenditure. An improvised water-gas plant had previously been considered, but was at once discarded because of the cost involved and the unavoidable delay of construction. Water gas was undoubtedly the solution to the problem; and the continuous vertical retort apparently offered the widest scope for immediate experiment. As the writer had the satisfaction of proving shortly afterwards, this was most excellently adapted to the purpose.

At that time we were already making about 10 p.ct. of water gas by slight steaming in the retorts; and it only required a little preliminary experimenting to prove to ourselves that the process could be carried much further. This we proved conclusively with the tests that followed. In the Glover-West vertical retorts, the carbonizing process is continuous. The coal enters at the top and slowly travels down the length of the retort until it is finally discharged at the bottom in the form of coke. The process could best be described by quoting from Messrs. West

> Coal is supplied to the coal-feed hopper above each retort, and slowly and continuously descends down the retort to the coke-receiving chamber below. The coal, in passing through the heated retort, becomes thoroughly carbonized, and the residual coke is extracted by means of a mechanically operated extractor at the base of the retort. The speed of the coke extractor determines the rate at which the coal passes through the retort; and this speed can be varied to meet all requirements. As the coal passes continuously down the retorts, the heat gradually penetrates towards the centre—the speed of coke extraction being so regulated that complete carbonization is effected towards the base of the retort, thus forming a taper "core" of coal.

It is obvious that the slower the speed of the descending coal, the shorter will be the core. If the speed be so adjusted that the apex of the core is high enough up in the retort to leave an ample depth of incandescent coke below, the lower half of the retort can readily be made to answer the purpose of an ordinary producer. Dry steam injected under sufficient pressure into the base of the retort will be drawn up through the incandescent coke, producing water gas, which will soon find its way to the sides of the retort and thence out into the main with the rest of the gas.

The plain water gas, in its so-called dry and absorptive state, readily picks up, in its upward course through the retort, some of the unattached hydrocarbons—that is, hydrocarbons which in the usual process of carbonization would have been absorbed and carried off by the tar. It is well known that the hydrocarbons referred to can be reclaimed by cracking. That is to say, the tar in contact with an incandescent surface can be made to yield a fair portion of useful permanent volatile compounds which in the ordinary carbonizing process are invariably carried off by the tar. In this system the complete operation is accomplished inside the retort. The tar leaves the retort practically stripped of volatile constituents, and the absorption by the gas is effected at a high temperature. It would seem natural to suppose that the methane, ethylene, acetylene, and benzene series of hydrocarbons would mainly contribute to the enrichment of the lean gas; also that they are absorbed and retained by the mixture that finally leaves the retort. The composition of the tar (which, unfortunately, I cannot give here) and the diminished production per ton of coal, together with many minor indications in the retort-house mains, all lend support to this theory.

A thoroughly balanced operation inside the retort, where the gases are at once generated and intimately mixed under the influence of high temperature, could easily explain the conversion and absorption of various hydrocarbons which otherwise would have found their way to the tar-well. As the carbon of the coke present in the retort is far in excess of the quantity of steam injected, there is no reason to suppose that any of the coal gas hydrocarbons could have passed through decomposition. And while it must be admitted that the quantity of steam employed is considerably in excess of the theoretical amount required, it must likewise be granted that the loss is comparatively small, and could have been altogether avoided in retorts where the outgoing coke was not utilized for preheating the secondary air.

Incidentally, a portion of the carbon requirement for the operation is met by some of the graphite formed in the retort. This is of considerable importance, especially where there is little or no market for this product, as happens to be the case here. The scurfing loss, previously rated at some 3½ p.ct., is now reduced to approximately one-half; and retort wear (the unavoidable accompaniment of scurfing) is naturally reduced in like ratio. It may be mentioned that it is the carbon in the lower half of the retort that enters mainly into the composition of the water gas, because the entire water-gas process is localized in this section, and what little carbon is required to be removed in scurfing comes almost entirely from the upper end of the retort.

It is clear, from the nature of the process, that a strong tendency towards overheating should exist at a point about midway up the retort. A somewhat reduced temperature maintained at this point outside the retort will easily check this tendency; while practically uniform temperature should be otherwise maintained throughout. A decided advantage, and one that is not to be underestimated, is that the coke now fails to hang-up inside the retort, as it frequently did under normal operation. On the other hand, the fuel consumption under the benches is higher, and the coke production smaller, than under plain carbonizing conditions. The coke, however, does not seem to leave the retort any cooler than before; and the secondary air, so far, gives no indication of having suffered appreciable reduction of temperature.

Dry steam is injected into the base of the retort under 40 lbs. pressure. While superheated steam would have been preferable, it was not available; and it is doubtful if the cost of the necessary installation to produce it would have been warranted. Owing to the cooling action of the secondary air on the outgoing coke—a feature of the Glover-West retort—a portion of the steam is wasted through condensation. Few lines of comparison can be drawn between the steaming of intermittent verticals and the process just described. In the former, it is a case of alternate periods of carbonization and water-gas production. The relatively small duration of the water-gas period, owing to the impossibility of sustaining the necessary temperature in the coke mass, confines the process as applied to intermittent vertical retorts for the present within rather narrow limits. So far to my knowledge probably

no more than about 12 p.ct. of water gas has been produced at the end of any one carbonizing period. In the process as we have applied it to the continuous vertical retort, it is a perfectly balanced operation, with no limitation except that imposed by the minimum calorific value to be maintained. The production per ton can be doubled without any increase in labour; and apart from the loss entailed through diminished coke production and increased bench fuel, steam is the only item of expense to be taken into consideration.

While it is aimed to maintain a nearly uniform external temperature of 2000° Fahr. throughout the full length of the retort, it would be quite impossible at this moment to say with any exactitude what degree of temperature is to be found at the various elevations inside the retort. There is no doubt that the requisite temperature for water-gas making is uninterruptedly maintained in part by the inherent heat of the slowly descending coke, and in part by the heat transmitted to it from without. The retorts are 21 ft. long, 39 in. by 18½ in. at the base, and 33 in. by 8½ in. at the top. Out of the 21 ft. of length, 4 ft. at the base are utilized in extracting heat from the outgoing coke—mainly for pre-heating the secondary air and incidentally for cooling the coke; so that in reality there only exists 17 ft. of active retort.

The following comparative table shows, on one hand, the results obtained prior to our experiments in the early part of 1917, and, on the other hand, those that have been obtained by us since then. Slight steaming was practised by us ever since the date of inaugurating the vertical retorts; and it cannot be denied that the results, even then, were exceptionally good. The results achieved under the new method of operation, however, have surpassed all our expectations.

Coal Used.—Arley.	Plain Carbonizing Slight Steaming.	Combination Coal and Water-Gas Production.
Coal carbonized per retort per 24 hours	1845 kilos	1224 kilos
Gas produced per retort per 24 hours	738 cb.m.	950 cb.m.
Gas produced per ton of coal	400 cb.m. (14,120 c.ft.)	776 cb.m. (27,390 c.ft.)
Coke produced per ton of coal (dry)	693 kilos	640 kilos
Percentage coke produced per ton of coal (dry)	69·3 p.ct.	64·0 p.ct.
Fuel consumed per retort	0·262 kilos	0·255 kilos
Fuel consumed per ton of coal	129 kilos	188 kilos
Percentage consumed per ton of coal	12·9 p.ct.	18·8 p.ct.
Calorific value	540 B.Th.U.	436 B.Th.U.
Candle power	14·5	5·0
Percentage CO_2 (average of tests) in gas	1·8 p.ct.	3·5 p.ct.

It is quite evident from the above table that there is a 27½ p.ct. increase in retort capacity; also that the gas produced per ton of coal is nearly double that which could be produced in vertical retorts with plain carbonization. It is true that the calorific value is low, and the candle power very diminutive; but it must be remembered that the open-flame burner has long since been eliminated here, and the candle power standard justly disregarded.

The loss of coke sustained through diminished production is 5·8 p.ct., and added to this is a 6·4 p.ct. loss due to increased bench fuel—making a total of 12·2 p.ct. While this represents considerable loss, especially where coke sells high and coal is relatively cheap (which is not often the case), one must not forget that the main item of carbonization expenditure has been reduced to just one-half, and the net result must of necessity be a satisfactory one. After all, 12·2 p.ct. only represents the economy of fuel effected in our modern gas-fired benches over the old-fashioned direct-fired settings. It must be noted that the percentage of CO_2, while not below 3·5 p.ct., is still within reasonable limits. It is well known that a high percentage of CO_2 is practically unavoidable in a water-gas operation.

By operating a carburetted water-gas plant as we do, in conjunction with the retort-house equipment, there is no difficulty in sending out an improved quality of gas with a higher calorific and candle power value. In the carburetted water-gas plant we produce a 16 c.p., 590 B.Th.U. gas, which, when finally mixed with the retort-house gas, gives us a 9 c.p., 490 B.Th.U. gas, of satisfactory quality. In addition to all this, we have installed an oil-enrichment apparatus that can be adjusted to spray gas oil, coal tar, water-gas tar, or any product of the tar-still into any of the retorts in operation. This would become necessary in case of a temporary shutting-down of the water-gas plant.

The economy of fuel effected in this system of water-gas production over that of an independent plant will become quite obvious by reference to the above figures. It will be noted that the quality of the mixed gas will more than favourably compare with the usual theoretical figures. It stands to reason that coal and water gas, each separately produced and mixed within the holder, cannot be compared to mixed gas produced under these modified conditions.

In generating gas in an independent plant where coke is used, approximately 0·620 kilo. of coke is required for each cubic metre of gas made. Generating water gas in the retort-house, as is being practised here, takes only 0·372 kilo. of coke per cubic metre of gas. Besides interest and depreciation on plant, repairs and wages must be added to the former. In the latter, there is only a slight loss of steam to be charged against it. It is at once evident that the cost of water-gas production in an independent plant would be at least twice as great as in vertical retorts.

After running continuously for nine months with the coal consumption reduced one-half, one cannot but feel the tremendous importance of this new adaptation. At a moment like this, when coal and its transport is the great problem, I sincerely hope that our experience will be of general interest to the gas industry, and especially to those who, like ourselves, are fortunate enough to have a continuous vertical retort installation—proving itself, as it has, to be most flexible and adaptable, as well as economical, coal-gas plant on record.

I wish to acknowledge my indebtedness to Mr. W. C. Butler, the General Manager of the Pernambuco Tramways and Power Company, for his kind co-operation, and for the assistance that made the publication of the above possible.

NAPHTHALENE.

By W. FLETCHER, of Liverpool.

[A Paper read before the Manchester and District Junior Gas Association, Feb. 2.]

One of the greatest enemies the gas engineer has to overcome to-day is naphthalene; for, although there are many good remedies, more or less successful, no definite and practical solution to the problem has yet been reached. A fairly successful cure on one works may be a comparative failure on another. The war is responsible for many things, certainly for the increase in naphthalene troubles which many gas engineers are experiencing. Inferior coals and retort-house labour, together with the extraction of toluene or benzol from the gas, has had its effect upon the naphthalene problem. Again, the difficulty of obtaining oil for carburetted water gas manufacture has been a factor which has not eased the situation.

Although the quality and composition of the coal carbonized influence the amount of naphthalene made, I think we must all agree that the chief factors are the temperature at which the coal is carbonized and the conditions under which it is carbonized. In these days of inferior coal and restricted plant capacity, the gas engineer finds it necessary to carry high heats in order to get the last cubic foot of gas out of the coal.

Naphthalene is not produced to any extent at the actual time the gas is driven off from the coal; but when it comes in contact with the hot sides of the retort, it would seem that certain chemical action is set up, which results in the formation of naphthalene. In proof of this, we find that, with the same class of coal, the same temperature, the same duration of charge and size of retorts, we get infinitely more naphthalene formed with a light charge than with a heavy one—in fact, the heavier the charge placed in the retort the less likelihood there will be of naphthalene troubles occurring. It will readily be seen that this is so, because the hottest part of any retort is usually that part against which no coal is lying, which in a well-filled retort would be at the top; and it is this portion along which the gas would pass which would be sufficiently hot to form naphthalene. Briefly, then, the less the area of uncovered retort, the better.

Some years ago at one of the Liverpool works great difficulties were experienced due to stopped pipes, salts, and pitch in the hydraulic mains and different parts of the plant. The retorts there are of the horizontal type, 22 in. by 16 in. by 20 ft. long, worked by a Fiddes-Aldridge machine. The charge carbonized was about 7¼ cwt., and the period of carbonization six hours. The make per ton was 12,100 c.ft. The heats were high, but not excessive. After cleaning the apparatus, flushing the hydraulic mains with carburetted water-gas tar as a solvent, and then with liquor, cleaning the ascension and dip pipes, it was thought that if everything was made perfectly clean and the heats reduced until the coal was just well carbonized, we should perhaps be able to deal with any naphthalene which might make its appearance. However, it was found that the root of the trouble had not yet been found. Moreover, through reducing the heats, the make per ton came down. Experiments were then made with the chain of the "F.A." machine with a view to increasing the charge a little. The front door or push-plate was altered from being a top horizontally-hinged door to a vertically side-hinged door of lighter construction (while interfering as little as possible with the strength), and new wearing strips were fitted on the bottom or bed of the chain. The net result was an increased charge of about ¾ cwt. The result of even so small an increase was surprising. Stopped pipes and pitched mains became a thing of the past; and the naphthalene trouble was halved. The shape of the retorts would not allow of any further alteration in the size of the chain; otherwise I feel confident that the trouble would have been completely cured.

The naphthalene produced by vertical retorts compared with the amount produced by horizontals is practically *nil*. The reason for this is, I think, that the first part of the charge to be carbonized is the outside, or that part which is lying against the hot sides of the retort; the gas being driven off, making its way up the centre, and much cooler part, of the charge, away to the outlet or take-off without coming in contact with the hot sides of the retort.

Much more might be said with reference to the relationship between the conditions of carbonization and the amount of naphthalene produced; but as high heats are most desirable from the point of view of economy and good working results, let us pass on to some of the cures which are at the disposal of the gas engineer

to try and prevent the naphthalene being carried on to the street mains and services, and there deposited. The removal of naphthalene, either completely or partially, may be accomplished by several methods—viz.: 1.—By sudden cooling; 2.—By washing with special solvents; 3.—By carburation; 4.—By spraying special solvents into the mains.

Sudden Cooling.

Sudden cooling is not altogether desirable, as, by so doing, the loss in hydrocarbons becomes a serious matter. A point has been made at the Caryl Street works, of keeping the outlet temperature of the condensers at about 55° Fahr. when possible, while the inlet temperature averages about 112° Fahr.—a loss of 57°. Unfortunately, this is not possible in the hot weather, as the condensers are atmospheric.

Mr. W. J. A. Butterfield has compiled the following table in relation to the effect of temperatures on naphthalene:

Temperature. Degrees Fahrenheit.	Percentage of Naphthalene by Volume.	Pounds of Naphthalene Contained in 1 Million C.Ft. of Gas.
120	0·1070	325·0
70	0·0070	23·5
60	0·0047	16·0
40	0·0028	9·5
32	0·0008	2·8

The above figures indicate that, apart from supersaturation effects a million cubic feet of gas cooled from 68° to 50° Fahr. may deposit in the works mains about 14 lbs. of naphthalene. When it is remembered that 10 grains of naphthalene will completely block a ½-in. pipe for a length of about 1 ft., the effect of this bulk of naphthalene will be realized.

Washing with Carburetted Water Gas Tar.

Some gas engineers maintain that about a 30 to 40 p.ct. mixture of carburetted water gas is a good carrying agent for the naphthalene. No doubt this was a very valuable help before the war, when oil could be used at the rate of about 3 gallons per 1000 c.ft.; but nowadays, when it is so very difficult to obtain oil, this cure is of practically no value. Blue gas will not carry naphthalene. Another good remedy is to wash the gas with carburetted water-gas tar, and eliminate the naphthalene from the gas before it leaves the works. On some works this is partially done by causing a steady continuous flow of the carburetted water-gas tar through the hydraulic main in place of the usual liquor. I understand this has been very successful on many works. As we had not suitable storage tanks, &c., to give this method a trial at Caryl Street, it was decided to utilize part of the "Standard" washer for this purpose. The last three liquor chambers on the gas inlet side of the washer were utilized for the tar washing. The liquor was kept separate by drilling another outlet in the fourth, or now last, liquor chamber, about 2 inches below the top of the division plate. This simply meant that the capacity of the "Standard" washer for the extraction of ammonia was reduced by three chambers. A 1-in. diameter inlet and a 2-in. diameter outlet for the tar were fixed. The carburetted water gas tar was run in from an overhead tank through a special regulating cock, and was circulated through its own part of the washer in the usual way; the rate of flow being about 50 gallons in twenty-four hours for a make of about 800,000 c.ft. of gas per day.

Although this method was very satisfactory, it did not seem possible to extract all the naphthalene from the gas, as tests taken on the inlet and outlet of the washer showed:

	Grains per 100 c.ft. (Average).
Inlet to washer	9·5
Outlet of washer	3·4
Naphthalene extracted	6·1

It was then thought that the carburetted water-gas tar did not have time to do its work; and after a lot of experimenting, the most successful method found was to run the tar through at twice the speed, but to run the same tar through two or three times instead of only once. This proved to be very beneficial; and the results recently have been running as follows: 3·1, trace, trace, 3·5, trace.

It is not claimed that the difficulty has been overcome; but given good carburetted water-gas tar—and this is a very important item—to wash with, it has been shown that enough naphthalene has been taken from the gas to make it much more easily dealt with on the district. Undoubtedly, the far better method is to extract the naphthalene on the works, but in case this is not altogether possible, there are several devices in the form of vaporizers, atomizers, &c., no doubt known to most of you. For the benefit of those who are not altogether familiar with the construction and working of these devices, I may be permitted to give a short description of them. The installations in use for this purpose in Liverpool are the "Simplex" vaporizer, Messrs. W. Parkinson & Co.'s vaporizer, and the "Atomizer."

The "Simplex" Vaporizer.

The "Simplex" vaporizer is quite simple in construction. It consists of a long rectangular box-like casting mounted upon two pedestals. The box is divided into two separate compartments by a horizontal division plate, the top surface of which is ribbed in such a manner as to cause the vaporizing oil to take the longest travel possible. The top, or gas, compartment is fitted with a gas inlet and outlet (4 in. diameter) and an oil supply and outlet. The lower, or heating, compartment is simply fed with steam through a Bailey's reducing valve, which is set to give a constant pressure of 15 lbs. per sq. in. on the outlet side. A safety or blow-off valve is also fitted to blow-off at 16 lbs. per sq. in., and so keep the full boiler pressure—60 lbs. per sq. in.—off the vaporizer in case the reducing valve fails. The steam, after passing through the vaporizer, is led into a steam trap, where it condenses. The oil is fed into the top compartment by gravity from an overhead tank, through a sight feed; and the rate of flow is 12 gallons per day. The oil, on entering the vaporizer, which has been heated by the steam in the lower compartment, begins to vaporize, and by the time it has travelled the full length of the ribbed plate about 85 p.ct. has been carried away by the gas, the remaining 15 p.ct. flowing over into a seal-pot in the form of residue.

The travel of the oil is against the flow of the gas. In the majority of cases, the gas has to be drawn through the apparatus by means of a steam injector fitted on the 4-in. outlet; but if the vaporizer can be connected to the works mains so as to have a greater pressure on the inlet than the outlet, this steam injector need not be used. If there is a convenient valve on the main close to the site chosen for the vaporizer, well and good; but if not, the accompanying sketch shows a cheap and reliable form of valve which may be used.

This butterfly valve must be inserted in the main between the points at which the inlet and outlet of the vaporizer are taken off. The valve can be regulated to throw sufficient back-pressure to cause a certain volume of the gas to back-up the inlet pipe, through the vaporizer, and away to the outlet side of the butterfly valve, where the pressure is not so great. A difference of pressure of about 7-10ths between the inlet and the outlet of the vaporizer will be found quite sufficient for efficient working; but the valve may be either opened or closed a little, thus reducing or increasing the pressure on the inlet side and causing more or less gas to flow through the vaporizer. By laying the hand on the inlet and outlet pipes of the vaporizer, it can be easily ascertained if the apparatus is working satisfactorily, as the outlet should always be at a higher temperature than the inlet. The following illustration indicates clearly the position where the butterfly valve has to be fixed.

There is a considerable saving by installing one of these valves in place of the steam injector, to a vaporizing installation, a apart from the amount of steam saved, there is also a great saving in the time taken to pump the syphons on the mains on the outlet side. Since installing a butterfly valve at the Athol Street works, where the condensation of steam in the mains was a source of constant trouble, the difficulty has been entirely eliminated. This

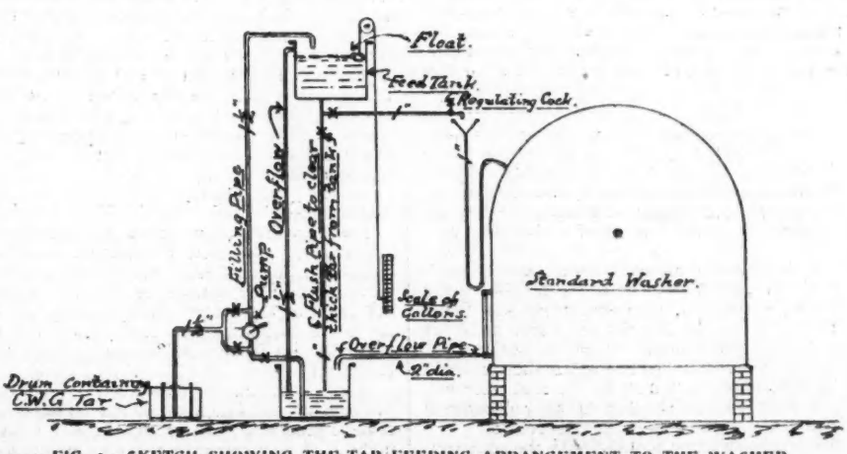
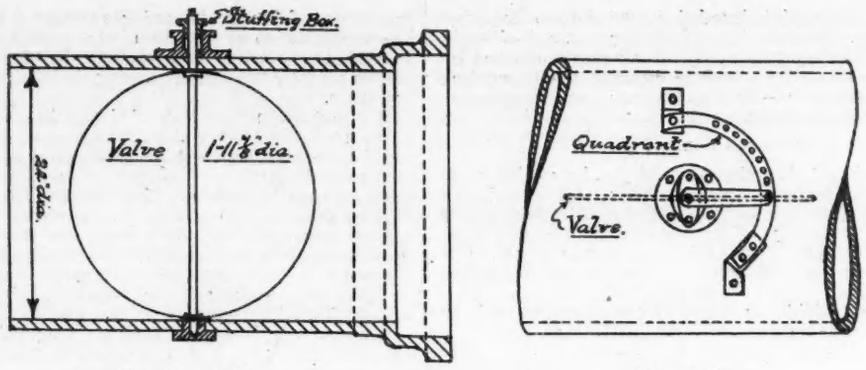


FIG. 1.—SKETCH SHOWING THE TAR-FEEDING ARRANGEMENT TO THE WASHER.



Side View of Valve. Plan of Valve.

FIG. 2.—SKETCH SHOWING THE CONSTRUCTION OF THE BUTTERFLY VALVE.

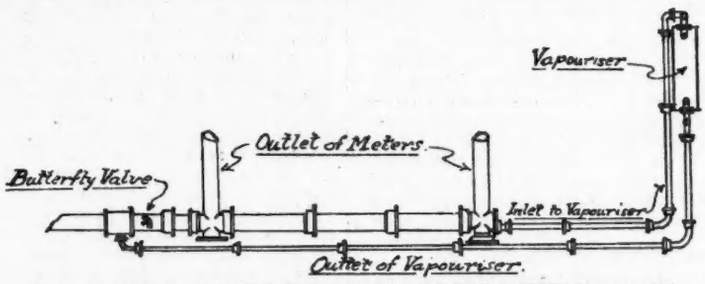


FIG. 3.—SKETCH SHOWING THE POSITION OF THE BUTTERFLY VALVE.

heavy condensation in the mains used to bring down a fairly large quantity of the oil which should have travelled along with the gas.

PARKINSON'S VAPORIZER.

This vaporizer is cylindrical in shape, and is made in different sizes; the largest size (having 6 in. diameter connections) being the one installed at Liverpool. It is 2 ft. 2 in. in diameter in the body, and stands 3 ft. 11 in. high. It consists of an outer casting fitted with gas inlet and outlet; the inlet being at the bottom and the outlet at the top. The apparatus is heated by means of a copper steam coil, 90 ft. long, made in one piece. There is the usual steam-trap fitted. The oil, which is fed from an overhead tank through a special sight-feed, which is arranged to show the quantity of oil passing per hour or per day by one minute's observation, drops from a distributor on to the coil or heating surface of the vaporizer, where it is vaporized and carried away with the gas. Any unvaporized oil is allowed to drain out at the bottom of the apparatus through a syphon pipe into a bucket.

One of the great advantages of this vaporizer is that full boiler pressure can be used on the steam coil, thus very much increasing the range of the apparatus. The quantity of oil being used on the vaporizer at present is 25 gallons per day; the residue collected being 1·5 gallons per day. The steam pressure is 40 lbs. per sq. in., and the volume of gas dealt with is 2¼ million cubic feet per day.

THE ATOMIZER.

In this system war kerosene No. 2 or other suitable solvent is introduced into the gas in the form of a mist, using for this purpose apparatus similar to that described by Mr. Henry Simmonds, of Bury, in his paper before the Manchester Institution of Gas Engineers at their annual meeting on Feb. 26, 1916.

The oil is contained in a special tank, at a pressure of 25 lbs. per square inch, and led down to the spray nozzle, where it meets a current of air at the same pressure. The design of the injector is such that the oil is forced into the gas-stream in the form of a mist. The amount of oil used is 15 to 20 gallons per million cubic feet of gas passed; and a certain amount of the oil is recovered at the syphons in close proximity to the works. Below are distillation tests of the oil used, and of that recovered from the syphons:

Fractions.	War Kerosene No. 2. Sp. Gr. ·8088. 1st Drop, at 190° Fahr., 3 p.ct. at 325° Fahr., 90 p.ct. at 520° Fahr.			Oil Recovered from Syphons. Sp. Gr. ·8390. 1st Drop, at 140° Fahr., 3 p.ct. at 275° Fahr., 90 p.ct. at 538° Fahr.		
	Fahr.	Fahr.	Sp. Gr.	Fahr.	Fahr.	Sp. Gr.
1st 10 p.ct. volatile	280°	to 345°	·778	200°	to 328°	·849
2nd " "	345°	" 363°	·782	328°	" 376°	·839
3rd " "	363°	" 378°	·792	376°	" 385°	·835
4th " "	378°	" 384°	·797	385°	" 411°	·835
5th " "	384°	" 412°	·803	411°	" 430°	·835
6th " "	412°	" 431°	·809	430°	" 448°	·835
7th " "	431°	" 455°	·816	448°	" 470°	·835
8th " "	455°	" 482°	·824	470°	" 498°	·835
9th " "	482°	" 520°	·833	498°	" 538°	·839
10th residue . . .	slightly viscous		·852	residue . . dark brown, opaque, viscous.		·861

From these distillation tests it is evident that the oil recovered is of different composition from the oil used. Does the gas retain a considerable portion of the oil atomized into it and deposit in its place something the gas previously contained? Perhaps the most surprising fact in connection with these tests is that there was no evidence of naphthalene in the distillates of the recovered oil. The average daily percentage of stoppages throughout the district since 1911 is as follows: 1911, 0·0035; 1912, 0·0013; 1913, 0·00054; 1914, 0·0246 (due to reduction in quality to 550 B.Th.U.); 1915, 0·0257; 1916, 0·0206; 1917, 0·0394 (due to reduction in carburetted water-gas oil and more coal gas made).

Records of stoppages over short periods show that the number of complaints increases considerably when the outside temperature falls below 60° Fahr. maximum and 50° Fahr. minimum; and the very cold winters of 1916 and 1917 have had their effect on these figures. At a casual glance, the figures fail to indicate the benefits resulting from the employment of vaporizers and atomizers, the use of which was extended to all the Company's works in 1917; but it must be noted that the unusual circumstances due to war conditions are now such as to contribute to serious naphthalene troubles. Yet we find that the total number of stoppages in October, 1917, were only slightly more than those recorded in November, 1915; these being the worst months in their respective years. The real question is not how many stoppages have we had, but how many would we have had without the use of vaporizers and atomizers.

One very encouraging sign can be taken from the fact that, before seriously taking up the naphthalene problem, the vast majority of the stoppages were between the consumers' meters and the street mains. Now, however, there are many cases of meters which will not pass gas; and upon examination it is found to be due to naphthalene deposits around the valves, and, in the case of wet meters, very often in the syphon pipe. Moreover, consumers' fittings are found stopped up in like manner; showing, it is hoped, that a point is being reached when the naphthalene will be carried right through and consumed at the burners.

Apart from actual naphthalene stoppages, there have been cases in the old parts of the town where the inlet to the meter and parts of the fittings have been almost blocked with corrosive deposits. The theory is that the oily nature of the gas, due to vaporizing and atomizing, has loosened the corrosion on the inside of the mains, and this corrosion has been carried along until it has accumulated at different points, causing stoppages. Assuredly this is a good sign.

REMOVING NAPHTHALENE FROM SERVICES.

A word might be said with regard to the methods employed in removing the naphthalene from the services. The inlet of the meter is disconnected, and by holding the hand over the service pipe one can judge fairly well to what extent the pipe is stopped. If there is no gas supply at all, then the service pump is attached and a pressure of about 150 lbs. per square inch is released into the pipe. After loosening the naphthalene, it is advisable to allow as much to blow out of the service as will, rather than force it back into the main, where it accumulates for further trouble. If, on disconnecting the inlet to the meter there is found to be a supply, though restricted, not more than (say) 50 lbs. per sq. in. of air pressure should be used. This should be done several times,

allowing the pressure of the gas to force the naphthalene out of the service.

Where the stoppage has occurred in a wet meter, a good remedy will be found in rinsing the meter out thoroughly with hot water, or by pouring a drop of paraffin oil down the inlet. Stoppages of the services may be cleared by applying a good pressure from the service pump, always blowing from the fittings towards the meter which must have been previously disconnected.

COMPARATIVE VALUES OF COKE-OVEN CRUDE BENZOLS.

[A Discussion by the Midland Section of the Coke-Oven Managers' Association, Jan. 26.]

The following report of the remarks made on the paper read at Sheffield by Mr. B. Wilson Haigh, of Barnsley Main, and his Chemist, Mr. Harold Lamb, did not come to hand in time to be published with the paper itself, which will be found on p. 201 of last week's issue.

DISCUSSION.

The PRESIDENT (Mr. J. W. Lee), in opening the discussion, remarked that the paper, and the method of its presentation, were typical of what should be always the fact on coke-oven plants. When there was this close agreement between manager and chemist, the best results would be obtained. This was evidenced by the results given in the paper.

Mr. J. H. THORPE (Barugh) said there were a few points on which he did not think he could fall in with the authors. They had quoted a statement by Mr. Diamond on the effect of the percentage of water on the absorption, and remarked that, if the percentage of water rose 2½, then the efficiencies dropped to 35 p.ct. He felt this was not altogether the fault of the water, and that there must have been some other conditions where the water had been allowed to get into the absorbing plant through the hot gases. If the remainder of the plant had been provided with an efficient heater, the loss would not have occurred. There was something more than the 2½ p.ct. of water accounting for the 35 p.ct. of loss. The next point he had noted was that the authors said that, in case of benzol absorption, they preferred only to pass the amount of oil through their scrubbers which they passed through their stills. He thought the better way was to keep the scrubbers going with plenty of oil passing through, but not necessarily to pass the whole of the oil through the still. In the statement made, later on, of the details of a comparative method, the authors said the benzol which was absorbed was practically nearly always of the same value. He disagreed. He thought that in benzol absorption, there was a fractional absorption. Where they had in the summer time warmer gases than in the winter, they would absorb nearly all the toluene and naphtha, but fail to absorb the benzol. His main criticism was of the graph presented, which attempted to show the comparative values of benzols of various strengths. He took it that in every case the authors had distilled up to 200° C. [Mr. HAIGH: Yes], and they took the material left in each case as the creosote. With a low-grade benzol, it was obvious that they had far more creosote in it; and they distiiled between 190° and 200°. He suggested that they were distilling material off which should be remaining behind. The percentage of material distilled between these two points caused a very serious error; and from his own experience it gave much too high a value on the low-grade material.

Mr. T. B. SMITH (Stockbridge) said that, in carrying out some experiments in Durham during the different parts of the year, he, perhaps, had rather excessive quantities; but it gave a better opportunity of experimenting. On cold days, the percentage of toluol and naphtha rose, and the benzol dropped. The temperature of the atmosphere prevented the statement being made that the composition of the crude benzol was always the same.

Mr. M. E. NICKLIN (Wombwell), referring to the water-content in absorbent oil, thought there was sufficient evidence to say that the suggestions were wide of the mark. He had had benzol absorbing oil, during a breakdown, passing through the scrubbers containing as high as 45 p.ct. of water in the oil, and recovering at a minimum 75 p.ct. at the ordinary yield. In regard to the saturation of the oil, the authors did not advocate a low degree of saturation, and gave 2 p.ct. He would like to know by what test they obtained this. One might get a result of 2 p.ct. which, tested with a better fractionating apparatus, would give 4 p.ct. Two men working with the different figures might have the same oil; the difference being in the method of carrying out the test. The industry ought to have some standard form of test. There was a further point which struck him as being remarkable; and it did not bear out his own experience. In the rectification of the crude benzol—taking 65 p.ct.—when worked upon a large scale, they got something like 14 or 15 p.ct. of crude oil. Allowing 5 p.ct. loss worked out on the crude, in washing, this would give a yield of 80 p.ct. of products, which he thought was rather high.

Mr. W. GREEN (Manvers Main) said in one respect he must speak in conjunction with Mr. Nicklin, and that was as to the point of the saturation of oil. They were all there again, as they had been a couple of years ago, dealing with a benzol paper, but still without a standard test. To-day they had Mr. Haigh speaking about the 2 p.ct. Yet they none of them knew exactly what they were talking about, because they had no standard test which could make the point definite. In regard to the creosote reference in the paper, attention was drawn to the increase of creosote in the benzol, and it was pointed out that it depended to some extent upon the coal used. He (Mr. Green) would suggest that it depended more on the conditions of temperatures on which the still was worked. In connection with Table III., where they had comparisons of the benzol test and the flask test of the rectified products, on the rectified they had certain varying proportions given, and the comparison was illustrated with the amount of carbon disulphide present. He thought the point would have been better thrashed out if they had had quantitative estimation. He would like to ask if the authors or any members present had had any experience of centrifugal washers in connection with benzol recovery, and as to what exact advantages these were supposed to give in reference to the work of the plant?

Mr. E. MILLINGTON (Rockingham), referring to the phrase in the paper, "since the effect on a washing operation is not known with sufficient certainty," &c., suggested that this must be known before any charts were prepared. In his experience in various crude benzols, the paraffin was not only there in small quantities, but in some cases was such as to affect the boiling point considerably. Had the authors made any experiments in estimating to see if their paraffin content was the same?

Mr. T. P. CARR (Waleswood) observed that the authors considered it important to keep the temperature of the scrubbing oil not below that of the gas passing through the scrubbers. Very often one could not get the temperature of the gas as low as one would like. Where the cooling water had to be recooled in a wooden tower cooler, one often could not get it below 30°. It often paid better to have a large preheater to the still for taking out the water from the creosote and circulating plenty of creosote round the scrubbers; otherwise they could recover very little benzol. He could not agree with the figures quoted from Mr. Diamond. He (Mr. Carr) had had the same experience as Mr. Nicklin had. He thought it must probably have been a case of Mr. Diamond's circulation being very small, and a little water in the oil affecting the volume of the oil going through the scrubber. He thought Mr. Diamond must have had some other reason for the figures. In regard to the oil going into the still, he (Mr. Carr) agreed that the oil should never be less than 110°. They could not keep the water out of the oil at a less temperature.

Mr. NICKLIN remarked that a point had been made in regard to the temperatures of the oil entering the still. Personally, he did not think it was so much a question of fixing definite temperatures for these two points at all, but a point of what they were out to obtain. They were out, first, to strip the gas as much as possible. Having got the benzol out, the next point was to get it out of the oil as efficiently as possible. The question of temperature came in really with regard to the deposition of the water in the still. He had found in an experience of his own that by obtaining an initial temperature of 115° and an outlet temperature of about 105°, he could get maximum results and keep the creosote oil pretty well clear of water. The question had been raised of the comparative value of crude benzol. From the statement made in the paper, it appeared that the value of 63 p.ct. crude benzol was practically as good as 65 p.ct. His own experience was that it was quite possible that the 63 p.ct. crude benzol might be better than 65 p.ct. There were strong arguments against the retort test. It did not worry people much when they made and distributed their own crude benzol; but it mattered when they were selling crude benzol, and had to make a reduction in the price. There was another point—particularly at the present time, when the national needs made special demands on the industry—and that was that if they worked the plant for 65 p ct. they would get a certain make; but if they worked for 63 p.ct. they would get a greatly increased make. If they obtained 800 gallons of 65 p.ct. per day, and reduced the conditions to produce 63 p.ct., the increase was considerably more than a gallon per 100. The retort test was not a reliable one, and should never be used as a test for fixing the price of benzol, but should be substituted by a quantitative test—something on the lines of the Government specifications at the present time.

Mr. J. A. WILSON (Staveley) said that the authors' statements in regard to determining values were borne out by a recent paper by Dr. Spielmann and Mr. Petrie. At his own place, they had had a number of samples, apart from their own product, to examine; and the results had been quite extraordinary. They had a series of samples taken over several days. These were carefully fractionated. From a test of their own benzol, they obtained a test of 65 p.ct. at 120°. From 65 p.ct. crude on the retort test, they got 68 p.ct. of rectified products. In practice, some years ago, from 65 p.ct. crude they got 70 to 72 p.ct. In some samples offered to them by merchants, they had one which tested 64 p.ct. at 120°, and they only got 60·3 p.ct. of rectified products; but the loss on washing was 24½ p.ct. There was a great amount of unsaturated bodies. They could not possibly estimate the value of crude benzol from retort tests in samples like this. They had another sample which tested 43 p.ct. at 120°, and they got 65 p.ct. of rectified products from it. Another tested 66 p.ct. at 120°; and this only tested 60½ p.ct. of rectified products—the loss on washing being 20 p.ct. They could not depend on the retort test for benzols from other sources, as it would lead one far astray, though they might get some satisfaction from it in their own production, where they knew the general run of the benzol.

Mr. GEO. CHRISP (Silverwood) said, in regard to the water in oil, they should bear in mind always that some oils would hold a lot more water than others without serious detriment. With regard to the saturation point of benzol, the best thing was to make the test as nearly approximate to the working conditions of their plant as possible; and he took it the authors were referring to their own particular plant. They had taken a test with a final temperature somewhere near that of the still they were working—probably 160° C. A 2 p.ct. saturation at this figure was rather low. In his own case, he had to fix his saturation point to come in with other things—the volume of steam and the volume of cooling water available, &c. Perhaps the authors could tell exactly what they meant by their 2 p.ct saturation. He would like specially to compliment Mr. Haigh on having brought his chemist to help him in the paper. It was a step worthy of emulation, to give the assistant due credit for his share in the work.

Mr. GEORGE TAYLOR (Silverwood) said it had occurred to him that there was still one point which never was raised, and that was the mechanical construction of the still. They had talked about strengths and water and temperatures, but never about the diameters of the still, or the kind of superheater, or anything of this sort. He was reminded of it by the mention in the paper of a new departure. So far as he knew, there was no reason why an ordinary benzol still should

not be heated in every tray by dry steam. Stills in this part of the country seemed to be rather taller and smaller in diameter than in some other places; and he was not sure that the excessive height by comparison with girth was an advantage. He thought a very tall still gave rise to condensing action in the top—a dephlegmating action, if they liked—which was not beneficial in the stripping of the oil. It would be of interest to all members if some information as to the mechanical construction of the still, its area per gallon of oil, or some definite information to let them know how they were working with regard to construction, were given.

Mr. W. O. HUMPHRIES (Beighton) asked if Mr. Nicklin had found his light oil depreciate in value when he carried such a high percentage of water in the heavy oil.

Mr. NICKLIN said he did not. The value only depreciated in light oil to the extent that in distilling such a mixture in the still one also made a light crude benzol—60 p.ct. instead of 65 p.ct. This meant a great proportion of light oils were carried over; but the actual composition of the creosote did not fall to any great extent.

The PRESIDENT said his own experience was one in which, perhaps fortunately, they did not often buy crude benzol; so they could make what they like. He was sure that, if this was at all possible, it was the best plan to get the largest amount of crude out, no matter what its quality might be. They could work it up afterwards. If they produced about 60 p.ct. they obtained a much higher yield than in attempting to produce 65 p.ct. at 120°. On his plant, at a top temperature of 110° and an outlet temperature of 105°, water could be kept practically entirely out of the oil. There had been occasions when they had had 60 p.ct. of water in the wash-oil, and there had, of course, been heavy losses, but nothing like those mentioned in the paper. Those quoted in the paper, however, were not agreed to by the authors.

Mr. HAIGH said it was, perhaps, too much to expect him to attempt to answer all the points in every detail. As Mr. Taylor had said, the size of the still had an important bearing on the matter. It would be remembered that the paper did mention that they all had to deal with plants with the designing of which they had had nothing to do; and their business was to work them to the best advantage. In his own case, the still was only 3 ft. square; and the amount of fuel heat they would get was very small. There was very much room for further information to be brought forward on this point. In looking up subjects for the paper they had come across something by a French writer, who stated that the amount of wash-oil to be passed through a 4 ft. still was 400 gallons per hour, and the amount through a 6 ft. still 1000 gallons per hour. Heights were not mentioned. In regard to the details of the test for saturation, Mr. Lamb would deal with that. He was glad that Mr. Wilson had mentioned the work of Dr. Spielmann and Mr. Petrie. Some of the figures got by the flask test by Mr. Lamb and himself agreed very much with Messrs. Spielmann and Petrie's estimate, especially with regard to the toluol content. They found their tests agreed exactly to the curve; but their benzol figures were low, though the authors' were taken from a rectification test, and Dr. Spielmann's were taken before rectification. Perhaps the washing losses had something to do with the loss. A good deal had been said about the graph; but he would emphasize the fact that this only applied to benzol produced on their own plant, and not to any other benzol. The benzol from his (Mr. Haigh's) plant contained practically no paraffin at all. As Mr. Nicklin had mentioned, the chart would be of no use for this purpose. Everyone would have to prepare a chart of his own. He had no doubt that if members would make such a chart for the benzol they handled in large quantities the result would be beneficial. Mr. Carr had spoken of the comparative temperature of the crude oil in the gas, and mentioned 30° for his gas, which, of course, was very high indeed. He (Mr. Haigh) would not advocate this with a gas whose scrubber temperature was 30°. The oil should be a degree or two above this. This would be adding waste to waste; but if the temperature was about normal, he thought every member would agree that it was better to keep the temperature of the oil a little higher to save condensation in the oil. The question of water in oil was a very important one. He was glad Mr. Lee had drawn attention to the fact that the author of the paper did not agree with Mr. Diamond's figures. But they did agree that it was very important to keep the water out of the oil as much as possible. The ideal was certainly to work a dry oil, and use every means possible to this end. Mr. Green had suggested that the creosote in the benzol did not entirely depend on the coal being used, but more on the way the plant was worked. He (Mr. Haigh) fully agreed with this. Mr. Nicklin had given 14 p.ct. creosote. The authors' references to this, of course, were taken from their own actual rectification, and did not include naphthalene. With regard to Mr. Thorpe, on the amount of oil passing through the scrubbers, the authors had had in mind that one could flood as much oil through the first and second scrubbers as one liked; but they would emphasize that, to get the best results, they thought the proper method was to circulate as much oil in the last scrubber as they were passing through the still.

Mr. LAMB said they (the authors) entirely agreed with Mr. Thorpe that, in regard to the proportions of the constituents in crude benzol, they obtained differences in summer; but was it thought that they differed sufficiently to make much difference in the retort test result? He had not found it so. Of course, they referred only to benzol from the same plant, and made no attempt to adapt the chart to what one might call "foreign" benzols. They did find a slight difference, and endeavoured to scrub most efficiently both summer and winter. Mr. Lamb proceeded to describe in detail his method of testing, and added that 2 p.ct. saturation of benzol meant approximately 2 p.ct. of benzol in the oil. This was largely on account of the smallness of their own still.

The PRESIDENT: If a still is small, surely it is necessary to get the best saturation possible, and not the lowest?

Mr. LAMB said they did the same tests on the question of the saturation; and thinking that possibly by increasing the saturation they would throw less work on the still, they did increase it up to nearly 4 p.ct., and found that, although the relative stripping was more efficient, they were left with very poor debenzolized oil, so they returned to the 2 p.ct.

Mr. NICKLIN, in moving a vote of thanks to the authors, said much new material had been given to work upon. The members' knowledge of benzol should be greatly increased and improved by experimenting on their own plants in the manner suggested.

Mr. SMITH, in seconding, said they were constantly told by Government officials that the aromatics were the essential parts from their plants, and therefore they must get the highest yields. This could only be done by system, the footstep of which was undoubtedly the standardization of works tests. Much of the anticipated result from such papers and tests as the industry had had was lost owing to the Government being so bound up in red tape. The industry was only just getting to know what it was to do. They had not, as yet, anything practical in the way of standardization of tests, and he sincerely hoped for something of this sort in the future. The Government would do little; and as the only responsible body, it was the duty of the Association to do something of a practical nature.

The PRESIDENT said Mr. Haigh had been a stalwart in the Association from its beginning. He was their first Treasurer, and had rendered splendid service from the start, and had added to it that afternoon. The Association welcomed Mr. Lamb as, for the first time, giving voice to his thoughts in their midst.

Mr. HAIGH, responding, said a good deal of the paper was written deliberately to provoke discussion; and he was pleased it had so well served its purpose. He was glad the Association endorsed his action in bringing Mr. Lamb along. Mr. Lamb had done most of the experimenting, and he (Mr. Haigh) could never have prepared such a paper without Mr. Lamb's co-operation.

MANCHESTER DISTRICT JUNIOR ASSOCIATION.

In accordance with the programme that had been arranged, about fifty members of the Association on Saturday afternoon visited the Ormskirk Gas-Works, where they were fortunate enough to find Captain W. M. Carr, the Engineer and Manager, home on leave. After spending an hour-and-a-half in the works, the visitors were entertained at tea by the Chairman and Directors of the Gas Company; and subsequently there was a business meeting, at which two papers were read—one by Mr. W. Fletcher, of Liverpool, on "Naphthalene," and the other by Mr. J. W. Thornley, of Salford, entitled "Notes on Gas Distribution." The first-named paper will be found on p. 248 of this issue.

Unfortunately, delay of the copy in the post, has made it impossible for a report of the gas-works inspection and discussions on the papers to be given to-day; but this will appear next week, together with Mr. Thornley's contribution.

Gas for Bakers' Ovens.

Confidence that practically all the business in the direction of providing fuel for bakers' ovens can at any time be captured by the gas industry, has led the "American Gas Engineering Journal" to devote during recent months a considerable amount of space to the subject. One of the latest issues to hand of our contemporary contains a description by Mr. William J. Harris, Jun., of the New York Surface Combustion Company, of installations using this particular system. One of the illustrations given is of two ovens, the consumption per week in which averages 19,650 c.ft. of gas for the 10 ft. × 12 ft. oven, and 23,380 c.ft. for the 12 ft. × 14 ft. one. They are in use 24 hours a day, and six days a week. The gas is usually lighted twice during the 24-hours, for a period of one-and-a-half to two hours each time; and the head baker says that he is able to get an increased capacity of at least 30 p.ct. over the coal-fires. One of the reasons for this is that the gas-fire heats-up more quickly than the coal, and a uniform baking temperature is reached very soon after shutting-off the gas. Then the coal-fire does not go entirely out, but must be kept "banked" while the baking is being done; and as the food cannot be placed very near the fire without danger of burning, at least one-fourth of the area of the oven is wasted. Again, as baking continues, and the temperature falls too low for satisfactory results, the gas can be lighted with the bake still in the oven, which is not possible with the coal-fire. With gas at 80c. per 1000 c.ft., and anthracite at $6·50 per ton, the fuel cost for gas in the same oven usually averages about 50 to 60 p.ct. more than coal; but when the increased capacity and actual saving in labour are considered, this additional cost practically disappears. With coal at $9 or more, gas may easily be the cheaper fuel, without taking the other items into consideration. The burner used in this system is of the impact type, with the air-gas mixture playing on a refractory bed of broken alundum or carborundum, which rests on the floor of the oven. One thing to which Mr. Harris thinks it advisable to call attention is the mistake of installing gas in old ovens which do not work satisfactorily with coal. As he says, "gas will heat a good oven as well as, or better than, coal; but it will not stop cracks which allow the heat to escape, nor hold-up an arch which is about to fall down."

Masonic.—At the 182nd Installation Meeting of the St. Thomas' Lodge, No. 142, held at the Liverpool Street Hotel, last Friday, Bro. Edmund J. Fox (Stanton Iron-Works Company) succeeded W. Bro. Couzens as W.M. for 1918. Among those present at the meeting and subsequent banquet were the W.M. (W. Bro. A. P. Main) and several Past Masters and brethren of the Evening Star Lodge, of which W. Bro. Fox has been a member since 1911.

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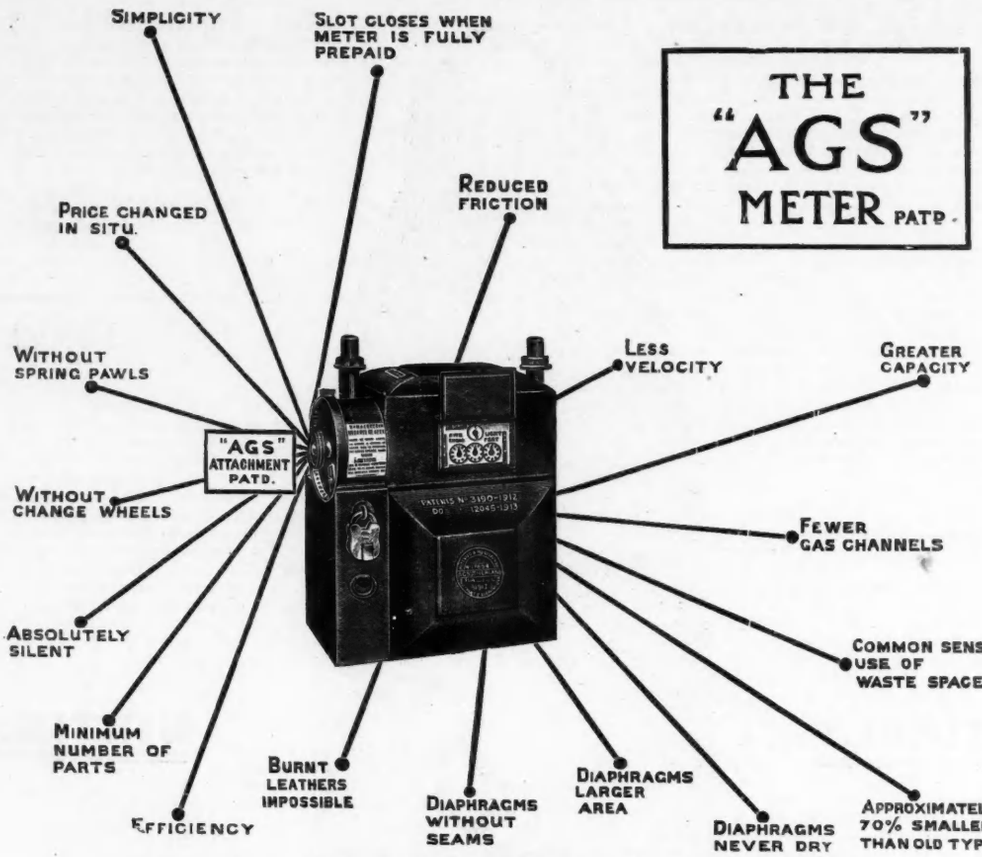

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CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Legality of Free Meters.

SIR,—I am obliged for the special paragraph in your issue of the 29th ult. [p. 192] regarding meter hire, as a reply to my letter of Jan. 1. As a simple layman, I cannot, however, read clauses 13 to 19 of the 1871 Act in the same light as you do.

Clause 13 enacts that every consumer of gas supplied by undertakers, if required to do so by them, must consume such gas by meter. The fact is that it is the almost universal practice for undertakers to "so require."

Clause 14 enacts that the undertakers *shall* supply such meters, &c. This again is almost universally done. Provided always that such owner or occupier *shall* (if required) previous to receiving such meter give the undertakers security for the payment to them of the price of such meter, or the rent of such meter, if he desire to hire the same.

I read this to mean that it is *obligatory on any owner or occupier of premises using gas to either own or hire a meter*. The only permissive part is that the undertakers may, in *their* option, either require or not require security *previous* to supplying a meter.

Clause 17 provides that every consumer *shall*, in the case of meter belonging to him, at his own expense, bear the cost of repairs, or, in the words of the clause, keep it "in proper order for registering such gas." There is nothing permissive here.

Clause 18 provides that undertakers may let for hire any meter for such remuneration in money, and on such terms, with respect to repairs, &c., and for securing the safety and return to them of such meter, as may be agreed upon, and such remuneration shall be recoverable in the same manner as the rents or sums due for gas. Here the "may let for hire" appears to be simply an alternative to the obligation to supply meters for purchase, and in the event of the consumer not electing to purchase and maintain his own meter.

I take it therefore that, in lieu thereof, he is under *obligation to, or shall*, pay hire, and also the cost of repair and upkeep to the undertakers.

Clause 19 enacts that, in the case of hire, the undertakers must keep all meters let for hire in proper order at their own expense, but can under clause 18 recoup themselves by charging the consumer such sum as may be agreed upon—that is, the undertakers and consumer may arrange a fixed sum per meter per annum, quarter, or month, or even per 1000 c.ft. for hire, repairs, &c. (inclusive); and this would put all consumers on an equal footing. Assuming that some consumers elect to own and keep in repair meters, while others get meters free (as may quite easily be the case), where would the equal treatment come in?

So far as I can read the clauses, everything seems obligatory; and in no way can they be read as giving undertakers power to give away anything for nothing, or to give away anything so as to cause inequality of treatment, or, in fact, to act directly in opposition to the words which now appear to have been added to section 13 of the 1847 Act: "Provided also that every such contract entered into by the company shall be alike in terms and amount *under like circumstances* to all consumers."

As I stated in my previous letter, I hold that, in circumstances such as I there indicated, all consumers are not treated alike, either as to terms or amount where meters are given free, as circumstances can only very rarely be "like."

I am glad, however, to see that you, Sir, do believe in a charge for meter-hire on the ground of equity as between consumer and consumer, and that is really the point which I desire should be arrived at and so attain

"FAIRPLAY ALL ROUND."

Feb. 1, 1918.

[The only question that exists between us and "Fairplay all Round" is as to whether the clauses referring to meter-hire are obligatory or permissive; and we must (until the matter is settled by higher authority) still maintain, notwithstanding the review of the clauses made by our correspondent, that they are permissive, so far as gas undertakers are concerned. The option of determining whether or not they shall "require" consumers to use meters and to give security rests entirely upon the administrators of gas undertakings; and the "may" in the clause "the undertakers may let for hire" must be converted into "shall" by the Legislature to make a charge for meter-hire obligatory upon the gas suppliers. It would be a strange thing if all the undertakings that have not been charging meter-hire (the Gas Light and Coke Company were not doing so a few years ago) had been misinterpreting the clauses and committing an illegality for so many years, with no one questioning their action in Parliament or elsewhere. The fact that some consumers may purchase their own meters where no meter-hire is charged, and so establish an inequality, is their own fault, and not that of the gas suppliers. At the same time a fair scale of meter charges for all is more equitable than meters free of rent.—ED. G. J.]

British Association of Chemists—Postponement of General Meeting.

SIR,—At the Inaugural Meeting of the British Association of Chemists, held in Manchester on Nov. 10, last, and attended by nearly 700 chemists, one of the resolutions stated that the next national general meeting would be held within fourteen days of Jan. 31, 1918. By that time the Executive of the Provisional Society hoped to be in a position to lay before the meeting the results of their negotiations with the Institute of Chemistry, and their recommendations on those results. But since the negotiations are not yet completed, the Executive have decided to postpone the meeting until completion has been arrived at. The Executive feel that the interested chemists will agree that such a course is the best to adopt.

Chemists will be interested to hear that the Executive of the Provisional Society now includes members from seven sections who represent the chemists in Manchester, Liverpool, Birmingham, Sheffield, Nottingham, Newcastle, and Huddersfield. Among other sections organizing are London, Leeds, and South Wales.

Information can be obtained from the Local Secretaries or the Executive Secretary.

T. F. E. RHEAD (Hon. Sec. to Executive).

10, *Malvern Road, Acocks Green, Birmingham,*
Feb. 1, 1918.

REGISTER OF PATENTS.

Packing for the Pistons of Gas-Meters. No. 112,310.

ALEXANDER, W., and PINCHBECK, LTD., of Holloway, N.

No. 132; Jan. 3, 1917.

This invention relates to a piston packing having grooves (filled with liquid) which moves to and fro with the piston over the walls of the cylinder or casing. The grooves in the piston are divided up into a number of cells; and preferably, in cases where the piston has more than one groove, the cells are staggered, as illustrated [see "JOURNAL" for Aug. 14 last, p. 285] in connection with the patentees' prior specification, No. 107,628.

Gas-Burners.—No. 112,316.

WILSON, L., of Keswick.

No. 211; Jan. 4, 1917.

This invention relates to gas-burners for furnaces such as those described in patent No. 18,931 of 1913, and those having a single adjustable piston, plunger, or sleeve valve, or two connected valves, for simultaneously regulating separate gas and air supplies.

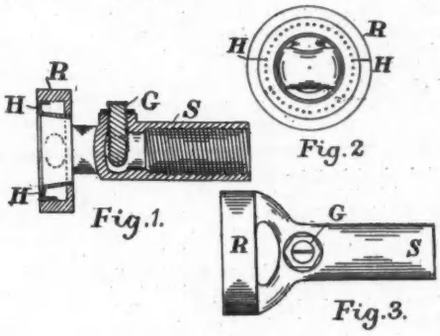
According to the present invention, the parts comprise: A central or axially arranged primary-air supply tube; a series of primary-air inlet ports independent of the tube, and formed in the body or outer casing of the burner; a piston or sleeve valve alone, or combined with a lift valve for simultaneously regulating the supply of gas from a gas inlet connection piece and the supply of the primary air passing to the nozzle of the burner; means independent of the valve or valves for controlling the primary air ports; and means for admitting secondary air to the burner.

Gas-Burners.—No. 112,356.

WILSON, W. A., of Armley, near Leeds.

No. 4096; March 21, 1917.

This invention relates to improvements in gas-burners, the object being to construct an annular nipple for gas-burners which is intended to be placed towards the inlet of the mixing-tube of the burner; while the gas-nipple ring is provided with a central air inlet, and has means for adjusting or entirely closing such air inlet. Fig. 1 is a section through the burner nipple; fig. 2, an end view looking down on the nipple; and fig. 3 an elevation.



Wilson's Gas-Heating Burner.

This form of gas-nipple is suitable for use in conjunction with a burner having a "venturi" type of mixing tube or one with parallel walls. The essential construction of the nipple is a supply pipe or pipes S leading, by means of branches, to an annular ring R with a central opening for the passage of air—made adjustable as to size or entirely closed by (say) an outer air sleeve on the hit-and-miss principle, depending on the configuration of the nipple. The ring may have its interior walls formed of a stamping adapted to fit into the base-piece of the ring with an outer lip to engage the outer wall of the ring.

In this inner wall, and towards the outer edge or periphery of it (by preference on a slight slope as shown), are drilled a number of holes H, close together and preferably in one ring. The holes are drilled at an angle of not more than 20°—an angle which causes the streams of gas to issue in a direction tending for opposite streams to meet,

but not too suddenly. The streams of gas form one narrow main stream which runs first in a parallel direction and then gradually expands. The gas supply pipe S screws into or on to the main supply pipe on a long thread, so as to render the nipple capable of being moved towards or away from the burner mixing-tube mouth. An air-way will be available through the centre of the nipple, and further air may be drawn into the burner between the outer edge of the nipple and the lower or outer edges of the mixing-tube. In some cases the central airway may be regulated as to size of opening or be entirely closed by a suitable hit-and-miss air regulating sleeve; and the nipple may have a gas-pressure regulator means such as G, many types of which are well known. The gas may be adjusted from the face of the nipple by a device adapted to shut-off a certain number of the holes, or a separate adjustable nipple may be placed centrally in the ring.

Making Running Joints Gastight.—No. 112,327.

BREEZE, V., and ALLEN WEST AND CO., LTD., of Brighton.

No. 64; Jan. 12, 1917.

This method of making running joints gastight is specially adapted for use in the case of two-cycle engines for making the joint between the crank and its case in which, of course, the combustible charge has to be compressed. It has been proposed to interpose split rings similar to piston packing rings between the revolving and stationary parts with this object in view; and the present invention involves the employment of similar rings. But the elastic split rings employed are used in a particular way, and not merely inserted in the usual manner. They are positively anchored at one end adjacent to the split to the rotating member of the engine, and rotate with it in contact with the stationary surface or bearing—the other end of the ring being left free to trail.

Cooling, Solidification, and Delivery of Pitch. No. 112,370.

MAJOR, J. L., of Sculcoates, Hull.

No. 6314; May 3, 1917.

According to this invention, the hot pitch is cooled and solidifies in the moulds of apparatus advantageously of the endless conveyor type, in which it is conveyed from the charging point over a track so that it is cooled and solidifies. A block of pitch is thus produced of a shape corresponding to the mould, and the block is discharged from the mould under its own weight, whereby the use of special means for ejecting the block is avoided.

Recovery of Thorium as Pyrophosphate. No. 112,380.

WELSBACH COMPANY, of Gloucester City, New Jersey—the Assignees of M. A. GOLTZ, of Winona, Minnesota.

No. 8550; June 14, 1917.

This invention relates to the separation and recovery of thorium as pyrophosphate from monazite sand; and it is based upon the discovery that thorium can be selectively precipitated as pyrophosphate directly from the sulphuric acid solution resulting from the decomposition of monazite sand by concentrated sulphuric acid, without the addition of a soluble pyrophosphate, such as pyrophosphoric acid or an alkaline pyrophosphate. This is effected by producing, from the orthophosphoric acid in the decomposition product of the sand, the necessary pyrophosphoric acid for precipitating the thorium.

The patentees claim to have found that, by carrying out the decomposition of monazite sand with concentrated sulphuric acid at a sufficiently high temperature, or by heating to a sufficiently high temperature the mass resulting from the decomposition of the sand with sulphuric acid, and by removing water from the orthophosphoric acid set free during the decomposition, it is possible to convert this orthophosphoric acid into pyrophosphoric acid. There is thereby produced within, and added to, the mass sufficient pyrophosphoric acid to replace the soluble pyrophosphate which it would otherwise be necessary to add to precipitate the thorium as pyrophosphate.

Midland Municipalities and Wages.—General questions affecting Midland municipalities—such as wages, conditions of employment, and other problems—formed the subject of a conference held on Friday at the Birmingham Council House. It was called by the Lord Mayor (Alderman A. D. Brooks); and delegates were present from Coventry, Dudley, Smethwick, Stourbridge, Sutton Coldfield, Walsall, Wednesbury, West Bromwich, and Wolverhampton. It was decided to form a Consultative Committee consisting of a representative of each town. The application by various classes of employees for the 12½ p.ct. bonus was discussed. The opinion was expressed that any decision arrived at by one municipality affecting wages should be communicated to the others so as to secure uniformity of treatment.

Wages Question at Birmingham.—An application has been made to the Birmingham City Council by the Amalgamated Society of Gas, Municipal, and General Workers for the payment of the 12½ p.ct. bonus to the Corporation employees who are time workers, and where the war-time advances have not reached 20s. The application has been referred to the Special Committee on Arbitration appointed by the Government for the purpose of deciding to what trades the awards should be extended. An application is also pending on behalf of the gas-workers for an additional advance of 10s. per week. The advances of wages and war bonuses granted to Birmingham Corporation employees since the commencement of the war amount in the aggregate to £600,000; and the present application as regards the 12½ p.ct. bonus, if applied throughout the Corporation departments, will represent a further £200,000.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Gas Companies' Coal Supplies.

Major NEWMAN asked the President of the Board of Trade whether an interview took place on Jan. 25 between the Coal Controller and the General Manager of the Tottenham Gas Company; whether the Company were informed that they must deplete their stock of coal by 300 tons per diem; whether he was aware that if this Order was obeyed it would gravely endanger the gas supply and involve stoppage of the numerous munitions works in the district; and what action he proposed to take.

Sir A. STANLEY, in replying, said that the Engineer and Manager of the Tottenham Gas-Works saw the Coal Mines Controller on Jan. 25, and he was informed that, in view of his large stocks of coal (55,000 tons, or about fifteen weeks' supply of his anticipated consumption of 3700 tons per week), 2000 tons per week of Durham coal had been diverted to another London gas undertaking. The stock of coal accumulated during last summer and autumn was to provide against the winter consumption; and it was not in the interests of the public utility companies in London generally that such large stocks should be accumulated if they were not going to be used. Up to the present, the consumption at the Tottenham Gas-Works had not exceeded 3100 tons per week.

Mr. WILL THORNE asked the Coal Controller if he was aware that the Worthing Gas Company were running short of coal and might have to shut-down their works in consequence; if he was aware that the bye-products from all gas-works were essential for the prosecution of the war; if he could state whether any special efforts were being made with a view to supplying all gas companies with the necessary amount of coal required for carbonizing; and if he would take action in the matter.

Sir A. STANLEY said the question of supplies to these gas-works had already been in hand, and steps had been taken to secure improved deliveries. The Engineer and General Manager to the Company, in a letter dated Jan. 23, informed the Coal Mines Controller that the supplies of coal were now coming in satisfactorily. Close watch was being kept on the various collieries supplying the Company, with a view of good deliveries being maintained.

Alliance and Dublin Gas Bill.

A memorial complaining of non-compliance with Standing Orders was deposited by the Corporation of Dublin in connection with the Bill of the Alliance and Dublin Consumers' Gas Company.

South Suburban Gas Company's Clerical Staff.

Application was made to the Lewisham Tribunal on Monday of last week by the South Suburban Gas Company for two ledger clerks—C. Ashley (31) and R. J. Fowler (29), who are graded "B 1," and a wages clerk, W. J. B. Cooper (27), "C 3." The National Service Representative (Mr. H. E. Harry) opposed any further exemption to Ashley and Fowler. He was, however, prepared to agree to a further term in the case of Cooper, on account of his low medical classification. In reply to the Chairman (Mr. F. Mead), the Secretary of the Company (Mr. Wilfred Wastell) said they would pay half salary if these men were called up. They were originally rejected, and afterwards put in Class "A;" but on re-examination were graded as stated. The Company felt that, having parted with all their general service men on the staff, they could reasonably ask for the retention of the lower category men. Of their clerical staff of 133, 41 were ineligible, and 73 of the remainder, or 80 p.ct., had gone. These men were all married; and having regard to the magnitude of their operations, and the fact that they had parted with so many men, the Company might reasonably look for some consideration. Mr. F. J. Marchment said he was disposed to exempt these men on the ground that they were engaged in work of national importance. Four months were granted in the case of Ashley, three months in that of Fowler, and six months in that of Cooper. Mr. Harry stated that he should take the two former cases to the Appeal Tribunal.

Scarborough Gas Company's Accounts.

Reporting upon the statement of accounts for the year 1917, the Directors of the Scarborough Gas Company state that, after providing for interest charges and the dividends on the preference stock, they recommend the payment of the usual dividends on the ordinary stocks for the year, at the rate of 5 p.ct. per annum, of which 2½ p.ct. was paid as an interim dividend. The sale of gas for the year shows an increase of 28 million c.ft. (11½ p.ct.) over the previous twelve months. The amount withdrawn from the reserve account to make up the sum required for dividends is £5880, as against £1836 last year. This increase is chiefly due to the great advance in the cost of coal, labour, and all materials. During the year, £5526 of 5 p.ct. War Stock has been sold out of the reserve fund investments. In view of the greatly increased costs of materials and labour, and the reduction of the reserve account from £21,000 to £8150 during the past three years, the Directors decided to increase the price of gas 6d. per 1000 c.ft. to all consumers, as from the December meter-readings. Mortgages, amounting to £7000, bearing interest at 5½ p.ct. per annum, and repayable in 1921, were issued to repay the 3¼ p.ct. mortgages to the same amount which matured on Dec. 31 last. The war bonus paid to the Company's employees has been advanced from 4s. to 10s. per week, owing to the further increased cost of living. The manufacturing and distribution plant has been maintained in an efficient condition. The installation of stoking machinery and a portion of the coke-handling plant has been completed; the former being put to work in May, and the latter in September. The coke-screening plant still remains to be erected.

LEGAL INTELLIGENCE.

LIABILITY FOR NEGLIGENCE OF WORKMEN.

SUPREME COURT OF JUDICATURE.—COURT OF APPEAL.

Thursday, Jan. 31.

(*Before* LORDS JUSTICES PICKFORD, BANKES, *and* SCRUTTON.)

Kimber v. The Gas Light and Coke Company.

This was an appeal by defendants asking that judgment might be entered on their behalf, or, in the alternative, that a new trial might be ordered. The action, which was tried before Mr. Justice Shearman and a Common Jury, was brought by Maude Emma Kimber to recover damages for personal injuries caused through the alleged negligence of defendants' servants. Plaintiff, while viewing certain premises which were to let, fell through a hole in the floor made by defendants' servants who were doing work in connection with the gas-fittings, and recovered judgment for £275. Defendants asked that the judgment might be set aside on the ground that the learned Judge was wrong in not ordering judgment to be entered for them upon the ground that the evidence disclosed no cause of action; that there was no evidence to support the finding of the Jury that the defendants' servants were guilty of negligence; that the learned Judge was wrong in not directing the Jury that plaintiff, upon her own admission, was guilty of negligence causing, or contributing to, her injuries; that the finding of the Jury that the plaintiff had not been guilty of contributory negligence was against the weight of evidence; and that there was no evidence to support the inference of fact drawn by the learned Judge that the defendants, by their servants, had negligently created a concealed danger.

Mr. THORN DRURY, K.C. (with him Mr. DOUGHTY), for the appellants, cited many authorities with a view of showing that defendants could not be held responsible for the accident, as there had been no negligence on their part in the creation of a source of danger—they being legally upon the premises to perform certain work in the ordinary course of business, and their servants were not aware that persons would come to the house to view it.

Mr. HOLMAN GREGORY, (with him Mr. ELLIS HILL), for the respondent, said the allegation was that the defendants' servants opened the door and admitted plaintiff, but gave her no warning of the concealed danger.

Lord Justice BANKES said the law imposed a duty upon every tradesman going into a house to do repairs not to lay a trap for visitors.

Mr. DOUGHTY said that, according to the decided cases, the liability was only upon the person in occupation of the premises, who, in certain circumstances, might have a right over against the person who created the source of danger.

Lord Justice BANKES: Do you say that a workman is under no duty to the servants in the house with regard to the way in which he does his work?

Mr. DOUGHTY: I submit he is under no such obligation.

Mr. HOLMAN GREGORY argued that if a person knew that another was going to a spot where he had created a hidden danger which that person knew nothing about, there was a positive duty cast upon the person laying the trap to give notice; and if he did not do so, he was liable in damages. The question of ownership was only a matter of defence. If a man dug a hole in a place where he knew other people might lawfully go, he was liable in the event of an accident happening. It was true the Gas Company were not the owners of the premises; but they had possession of them in order to do necessary repairs; and having left an open hole, they were liable.

Mr. DRURY, in reply, submitted that the making of the hole by the Gas Company's servants was not the creation of a concealed danger unless they had knowledge that persons might lawfully visit the premises.

Their LORDSHIPS reserved judgment.

PROSECUTION OF THE PORTSEA ISLAND GAS COMPANY.

Gas below the Calorific Standard.

At Portsmouth, on Friday, before the Borough Justices, the Portsea Island Gas Company were summoned on sixteen informations with respect to the supply of gas of less than 500 B.Th.U. when tested in accordance with the provisions of the Company's Standard of Calorific Power Order, 1917, made by the Board of Trade in conformity with, and in exercise of, their power under the Gas (Standard of Calorific Power) Act, 1916, on dates between Oct. 1 and Dec. 3, 1917.

Mr. J. H. HARRISS (instructed by the Deputy Town Clerk) prosecuted; Mr. JACQUES ABADY (instructed by Messrs. Monier-Williams, Robinson, and Milroy) defended.

It was agreed, on the suggestion of the Bench, that the whole sixteen summonses should be argued on one information.

Mr. HARRISS explained the statutes under which the gas companies were regulated to keep their product up to a proper standard. These Acts and Orders were all based more or less upon the Gas-Works Clauses Act, 1871, which prescribed a certain standard of illuminating power, and certain tests to determine whether it was up to the standard provided by the Act. By a subsequent Order, calorific value was substituted for illuminating power. Certain testing-stations had to be agreed upon between the Corporation and the Gas Company. Some little time after war broke out, the Ministry of Munitions approached most of the gas companies, and asked them to produce benzol and toluol for the purpose of making explosives. It was realized that the production of these materials would involve some diminution in the illuminating power; and a new Act of Parliament was passed, under which calorific value was substituted for illuminating power. In due course, the Portsea Island Gas Company made application to the Board of Trade for an Order altering the standard; and on March 1, 1917, the Order was made fixing a standard of not less than 500 B.Th.U. As this standard was of their own selection, it was to be expected they would not set up too high a standard, or one which they were not capable of keeping to on all occasions. In the months of October, November, and December, Mr. Moncreaff (the Gas Examiner for the borough) made a number of tests—eleven in October, four in November, and one in December—with the following results: On Oct. 1 there was a deficiency below the standard of 500 B.Th.U. of 77 B.Th.U.; Oct. 2, 74 B.Th.U.; Oct. 5, 49 B.Th.U.; Oct. 8, 58 B.Th.U.; Oct. 15, 59 B.Th.U.; Oct. 18, 19 B.Th.U.; Oct. 19, 82 B.Th.U.; Oct. 22, 64 B.Th.U.; Oct. 23, 12 B.Th.U.; Oct. 26, 56 B.Th.U.; Oct. 30, 47 B.Th.U.; Nov. 13, 16 B.Th.U.; Nov. 16, 30 B.Th.U.; Nov. 20, 24 B.Th.U.; Nov. 26, 18 B.Th.U.; and Dec. 3, 22 B.Th.U. Thus it would be seen there had been a very serious deficiency of calorific value, of great importance to the consumer in these days, when so many poor people were dependent upon gas for cooking and boiling. It meant that the cooking and boiling took much longer time, consumed more gas, and cost them much more than it would otherwise have done. Thus it became important that gas companies should be properly supervised in this way. The Company were always supplied with a copy of the result of the tests, and therefore could keep themselves informed of the state of the gas, and could have taken steps to remedy the deficiency as it occurred from time to time.

Mr. ABADY said this was not quite the case, as the Company did not get their copy of the report of the test until the following day.

Mr. *A. A. Moncreaff*, Gas Examiner for the Portsmouth Corporation, deposed to the examinations made between Oct. 1 and Dec. 3—all between the hours of 5 and 10 p.m., as prescribed by section 29 of the Gas-Works Clauses Act, 1871. On each of these occasions he found the test to show that the gas was below the standard of calorific value required by the Order. In the test he used the apparatus prescribed by the Metropolitan Gas Referees, which had been agreed upon between the Corporation and the Company. The tests were made at the testing-stations at Milton, Kingston Cross, and Arundel Street, but most of them at Milton or Kingston Cross, which were testing-stations provided for making tests in connection with the Company. He produced the results of his tests.

Cross-examined: Taking the test of Oct. 19, which showed the lowest results (418·32 B.Th.U.) at Milton, he arrived at the testing-house just before 4 o'clock, lighted the gas, turned on the water, let the water flow through for a time, and then waited for nearly an hour until the temperature appeared fairly regular. At 4.45, he started taking the gas-rate and then the water-rate. It was just before 5 o'clock when he put down the vessels for condensation; and at 5.10 he started the actual test. It was just after 6 o'clock when he started the second test, which was completed at 6.25. On the first test, he did not test the meter-connections as to soundness. He did not admit that he started making the test before 5 o'clock. It was not until twenty minutes after the time prescribed in the Order that he commenced.

Mr. HARRISS: The Order says that the test shall be made not before 5 o'clock.

Mr. ABADY submitted that the operations admitted to have been undertaken before 5 o'clock were all part of the test. [To witness:] Was anyone present at the test beside yourself?

Witness: No.

Why not?—There was no need.

Mr. ABADY directed attention to section 31 of the Gas-Works Clauses Act of 1871, whereby the Gas Company had the right to be represented at the taking of the test, and asked him why the Company were not represented on this occasion.

Witness replied that he could not tell. He had not given them notice of his intention to take a test at that time and place. He did not know that there was any obligation on him to do so. He had been Gas Examiner for about twenty-seven years. During the last ten years, the Company had been prosecuted two or three times, and during the whole of his experience convicted probably thrice. The tests at Milton were all lower than those at either of the other places. The average of the tests at Milton might have been 437 B.Th.U., as against 484 B.Th.U. at Kingston Cross and 478 B.Th.U. at Arundel Street. He had observed that the tests at Milton were exceptionally low, but had taken no steps to ascertain if there were any special reasons for this. It had not occurred to him to make inquiries at the gas-works; it was no part of his duty to do so. The Milton district was mainly supplied from the Hilsea works. Hilsea gas might go to Kingston Cross and to Arundel Street. He had been told the Company took tests at their works, but had not seen what apparatus they used. Tests made in the afternoon could not be compared with those made in the evening. Tests made on the works for calorific value would probably differ from tests made outside, and would show results 10 or 12 B.Th.U. higher. He had not made any tests at the works. He did not know of any town outside Portsmouth which had so elaborate a testing arrangement—three testing-stations—except probably London.

Re-examined: The apparatus used was an apparatus "similar" to that prescribed by the Gas Referees; and he carried out his test in the manner prescribed by them. After setting up the apparatus, the actual testing of the gas was begun after 5 o'clock. The Company themselves supplied and erected the testing apparatus.

After the formal proof of some correspondence, this concluded the case for the prosecution.

Mr. *William Doig Gibb*, called for the defence, said he was at present Technical Adviser to the Department of Explosives of the Ministry of Munitions, and explained that he appeared as a witness in his capacity of Consulting Engineer to the defendant Company. His Department were responsible for recommending to the Pool Board what quantities of gas oil might be allowed the different gas companies. The Pool Board was the section of the Board of Trade which arranged the rations of oil among the companies. Oil had become so scarce that it was necessary to constitute some authority to ration the limited

amount that was available throughout the country. The Pool Board were, in fact, the "Sugar Card" of the gas companies. The allotments to the companies had not been in any way disputed by the Pool Board. The quantities available had been divided to the best of their ability; but in no case had they been able to satisfy any company that they had got sufficient to meet their requirements. The Portsea Company had been rationed; and they had been rationed on the basis of the Company being able, with the supply allowed them, of furnishing a gas with a calorific value of 475 B.Th.U. Washing would still further reduce this value. Before the war no gas company would have considered the possibility of having to wash for benzol and toluol. He had made an inspection of the gas-works, both at Hilsea and at Flathouse. They were carrying out oil-washing at Hilsea, but not at Flathouse, and were doing it at the period in question, when these tests were made. Gas produced at Hilsea was water gas; and they could not make it of the prescribed calorific power, because they were not able to get the necessary oil. The water-gas plant there roughly represented 37½ p.ct. of the total productive power. The non-illuminating gas produced there was of 300 B.Th.U. To bring this up to 500 B.Th.U. would require at least 2½ gallons of oil per 1000 c.ft. of gas; and the Government only allowed 1¼ gallons. So that it was not possible for the Company to send out better gas, because of the action of the Government in refusing them oil. It was also increasingly difficult to repair plant. In addition to the trouble of obtaining suitable coal, there had been difficulty through a stoppage of one of the gasholder pipes from a deposit of naphthalene, which would tend to account for the low quality at Milton. The coal obtainable had been very bad. Asked if he knew of any place in England where the gas was of the full calorific value, he said he knew of none where it was above. It was very generally known to be below. In London, it was seldom above 440 B.Th.U.; and the London County Council had decided that there should be no prosecutions on this account within the districts under their jurisdiction. In all England there had not been a single prosecution of this knid against any gas company.

Mr. HARRISS objected.

Witness said that, to increase the calorific value to 500 B.Th.U., as required, would reduce the pressure to such an extent that, with the incandescent burners of to-day, it would be like having no gas at all. It must be one of two things—either they must have it in pressure and not in British thermal units, or in British thermal units and not in pressure. They could not have it both ways

Mr. ABADY, for the defence, said he first took the technical objection that the tests had not been made in accordance with the requirements of the Order, inasmuch as Mr. Moncreaff had admitted that he did not test the meter for soundness, and that he commenced his test before 5 p.m. The Metropolitan Gas Referees stipulated that it should be made between 5 p.m. and 10 p.m. But he desired to assure the Bench that he was not seeking entirely to get a verdict on a mere technicality. He admitted that the Company had not been able to supply gas of the standard calorific power prescribed by the Act; but he wanted to show how impossible it was for the Company, through Government action, to carry out their obligations. Under the circumstances, he contended that the time of the Bench ought not to have been occupied with such a case; and that no prosecution should have been launched under the very difficult and peculiar conditions against which the Gas Company were contending. The Directors were not out to exploit the public, nor were they seeking to take advantage of them in the manner that had been suggested, by charging more for an inferior article, or for less gas than formerly. But having regard to the evidence, it was clear that they were conducting the affairs of the Company in no way unfairly to their fellow citizens. The Company were labouring under difficulties over which they had absolutely no control; and it was unfair for the Town Council, or other local authority, to launch a prosecution against a Company who were in a difficulty for which they were not responsible.

Mr. HARRISS said he was prepared to admit that the Company were working under difficulties, and that they had not had sufficient oil, or such good quality coal. This, however, did not affect the matter. There was the standard set up by themselves; and if it were impossible for them to keep up to the standard, their proper course was to apply to the Board of Trade for the repeal of the Order, and get a new one.

The BENCH, after deliberation, announced, through their Chairman, that they recognized the difficulties under which the Company laboured. They were against Mr. Abady on all his points, and had decided to convict, fining the Company £2 on each of the sixteen informations—making £32 in all—with ten guineas costs.

On the application of Mr. Abady, the Bench expressed their willingness to state a case.

Chesterfield Gas-Meter Case.

The Chesterfield Magistrates have had before them a case affecting prepayment gas consumers. A man named Thomas Moran was summoned for the non-payment of his gas account, amounting to 18s. 0d. A collector of the Chesterfield Gas and Water Board stated that the money had been abstracted from a penny-in-the-slot meter, and defendant's wife admitted having taken it. Defendant pleaded that he did not know anything about the money; but he expressed his willingness to make the amount good. The Bench thereupon issued an order for the payment of the sum named.

Unlighted Irish Towns.—The Enniscorthy (co. Wexford) Gas Company announce that, owing to "unreasonable demands by their workmen for increased pay," they are obliged to close-down. The Company's charges stand at 6s. 6d. per 1000 c.ft. for power and 7s. 6d. for lighting, as compared with 4s. and 4s. 10d. before the war. The labourers of the Portadown Town Council being still on strike for increased wages, the public lamps remained unlighted during last week. At a meeting of the Council, Mr. Thornton suggested that, if the men did not accept the offer made to them, the members of the Council should themselves turn out and light the lamps.

MISCELLANEOUS NEWS.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Company's Bill in Parliament.

A Special General Meeting of the Proprietors of the Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. H. E. JONES presiding—for the purpose of considering, and, if thought fit, of approving, the Bill now being promoted in Parliament to confer further powers upon the Company.

The SECRETARY (Mr. Chas. W. Braine) read the notice convening the meeting.

The CHAIRMAN said he was sorry the Directors had had to bring the proprietors together in this inclement period, especially after the excitement they had had in London the previous night. They had, however, to comply with certain forms in promoting a Bill in Parliament. It would have been gathered that it was very important the Company should have a Bill this year for further powers, because they had really grown out of their present works. Their works required the expenditure of more capital upon them. They had also had to buy some expensive ships to bring coal from the North; and this had locked up a great deal of money. For stocks, too, they now needed more working capital. It was impossible to get any more money from the bankers by accommodation, unless they showed some disposition to raise more money. It was equally impossible, except at considerable sacrifice, to raise money in the Gas Market, which, as the proprietors knew, was much depreciated owing to the war. To raise money on the prevailing ordinary terms meant that they would have to pay permanently a larger rate of interest than they were accustomed to in this Company for the capital they required. Even the best railway stocks could now be bought to pay something like 6½ p.ct. That was a rate this Company would not like to pay in perpetuity. The only chance, therefore, to get money was to have a temporary arrangement by which they were allowed to borrow money, and to pay it off after the war. Incidentally, on all hands, their business had grown very much. During the war, people—especially coin-meter users—had shown a disposition to burn gas instead of coal; and this had rather overpowered their works. Before the war, the Directors were proposing to add practically 50 p.ct. to the power of the older works at Wandsworth; and they had all their plans made. But directly the war commenced, the Treasury put a "stopper" on that, and told them they must make no contracts for works, and raise no more capital. So their plans were put on the shelf for the time being. The second and the third year of the war came; and they found the demand for gas growing to such an extent that they really were unable to meet it in the way they would like to, without most expensive expedients, which would have had a bad effect on the balance for the dividend account. Then, incidental to the extension of the works, they had an old power to extinguish the rights over certain footpaths; and they bought-up property which it was necessary they should purchase under their last Act. It was necessary now to have money, and further powers in connection with this extension of their property. They might not want to use the powers; but it was necessary to have them in order, if required, to compel at any rate one owner who might stick-out, and prevent a public improvement and an essential extension for the Company. The Bill recited the Company's financial position in respect of capital. It provided for taking certain land delineated on deposited plans for the purpose of enclosing the footpath intersecting the works, and for widening a street. It provided for the raising of debenture stock on such terms as might be found necessary, and for such stocks being redeemable at the end of the war. The interest on this debenture stock was also provided for. There was authority to create and issue £200,000 of preference stock for temporary purposes, and provision for such stock to be redeemable at such times, in such manner, and on the terms and conditions expressed on the certificates. There was also provision for the consent of the Treasury to the raising of the money. There were some small domestic clauses at the end of the Bill as to the mode of cutting-off gas, conditions regarding the reconnection of such supplies, the supply of gas-engines and movable fittings, power to vary the price of gas for various purposes, and to enable them to give trade discounts. This was the Bill; and it was a mere matter of form that they had to read it to the proprietors, and to get their consent. The Chairman concluded by moving a resolution approving of the Bill, subject to such conditions, alterations, and variations as Parliament might think fit to make therein.

The DEPUTY-CHAIRMAN (Mr. R. Garraway Rice) seconded the motion; and it was unanimously passed.

There was no other business before the meeting.

BRENTFORD GAS COMPANY.

Report and Accounts.

In the report which will be submitted at the annual meeting on Friday, the Directors state that the accounts show a profit on the revenue account for the year of £105,474. After providing the interim dividend to June 30, fixed charges, and writing-down investments, there remains the sum of £41,111, which, with the balance brought forward from the last account, makes the amount of £92,216 available for dividends. The Directors recommend the declaration of the statutory dividends, subject to income-tax—namely: At the rate of 5 p.ct. per annum on the preference stock; at the rate of 4½ p.ct. per annum on the "A" consolidated stock; and at the rate of 4½ p.ct. per annum on the "B" consolidated stock. The increase in gas sold is 12·6 p.ct. over the previous year. The number of consumers is 121,078, as

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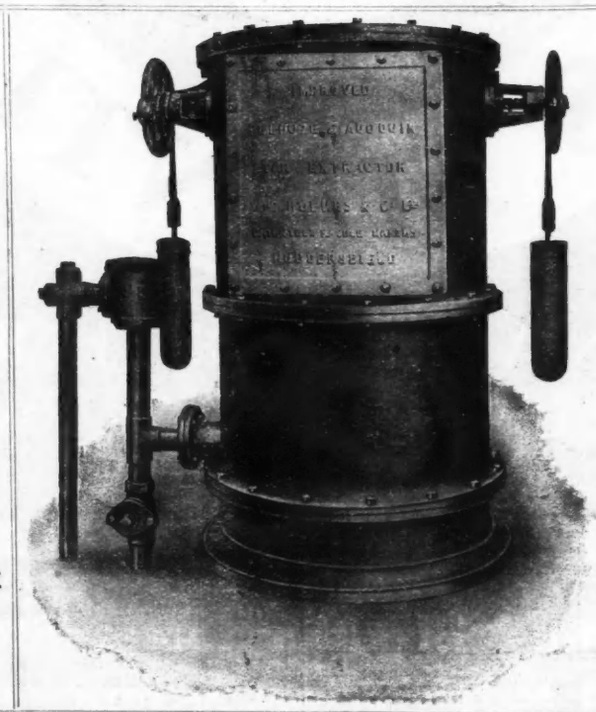

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SOLE PROPRIETORS:

THE RAMIE CO., Ltd.

(WARBURTON'S PATENTS),

Victoria Mills, Bredbury, near Stockport,

And Marple Bridge, Derbyshire.

SCOTTISH DEPOT: 1 WEST REGENT STREET, GLASGOW.

against 119,412 last year. The Directors have been again compelled to raise the price of gas, from July last, from 2s. 10d. to 3s. 4d. per 1000 c.ft. The Directors will, at a special meeting to be held after the general meeting, submit for the consideration of the proprietors a Bill it is proposed to introduce into Parliament in the ensuing session.

From the accounts accompanying the report, it is seen that the revenue from the sale of gas amounted to £668,604; from rental of meters, stoves, and fittings, to £91,234; and from the sale of residual products, to £189,897—the total receipts being £949,931. The expenditure on the manufacture of gas was £638,895; on distribution, £86,256; on management, £23,556; on rent, rates, and taxes, £34,006—the total expenses being £844,456. The balance carried to the profit and loss account is £105,474.

The working statements indicate that 242,887 tons of coal and 2,750,274 gallons of oil were used in the past year in the production of 4,865,986,000 c.ft. of gas (including 2,020,072,000 c.ft. of carburetted water gas), of which 4,415,124,000 c.ft. were sold and 4,487,705,000 c.ft. were accounted for.

GAS SUPPLY IN THE TOTTENHAM DISTRICT.

Board of Trade Supports the Company.

The Tottenham Urban District Council have received a rebuff at the hands of the Board of Trade in respect of the supply of gas in the large area covered by the Tottenham District Light, Heat, and Power Company. It will be remembered that the continuous complaints made by the consumers, and the representations made to the Tottenham, Wood Green, and Southgate Councils, culminated in appeals being made to the Board of Trade, notwithstanding the strong assurances from the Company that they were doing their utmost in face of war exigencies. The Board received a deputation from the Tottenham Council just recently; and the following letter has now been forwarded by the Board to the three local authorities referred to:

With reference to the correspondence between this department and your Council and other local authorities on the subject of the supply of gas by the Tottenham District Light, Heat, and Power Company, and to the conference at this office on Jan 22, I am directed by the Board of Trade to state that, as their nominees, they have discussed the various questions raised at the conference with the Ministry of Munitions, who are intimately concerned with the maintenance of an efficient supply of gas in your district.

The present position appears to the Board of Trade as follows: The allegations with regard to the unsatisfactory and inadequate supply of gas in the district are not disputed by the Company, and a public local inquiry would not be likely to elicit information beyond what is already generally known. Inquiries made by the Board of Trade have, however, satisfied them that the Company are doing everything in their power to remedy the existing conditions, and that there is good reason to think that, in the absence of unforeseen circumstances, a gradual improvement in the supply will be effected.

It would appear that the difficulty of maintaining an adequate supply of gas partly arises out of general causes due to war conditions, but also from the fact that the demand for gas has largely increased—the quantity now supplied by the Company being about 30 p.ct. in excess of the amount supplied before the war.

To meet additional requirements, the Company entered into contracts for the erection of plant which they anticipated would have been ready at the end of 1915, but which is even now not completely in operation and is still in the hands of the contractors.

With the plant as it now stands, an additional daily make of 2½-million cubic feet of gas has been obtained; and when the plant is in full working order, it is expected a further 1½-million cubic feet will be produced.

The Company have informed the Board that they are also renovating the gas-works at Enfield, which had been discontinued for some time; and the Ministry of Munitions have given priority for the necessary plant. The Board understand that when these works are completed, the situation, so far as can be foreseen, should become normal as regards the pressure at which the gas can be supplied.

It is, however, right to point out that the amount of gas oil which can be allocated to the Company will probably not be sufficient to enable them to comply with the normal requirements as regards the calorific power of the gas; and although the difficulty in this respect has been to some extent met by a temporary relaxation of the demands made upon the Company by the Ministry of Munitions for the supply of benzol and toluol, it is impossible to guarantee that the supply of oil can be increased, or even maintained at its present level.

This aspect of the question is fortunately of much less importance than that of the pressure; and if the quantity of gas made can be increased, as the Company have shown grounds for thinking probable, in the near future the main cause of the serious inconvenience which the gas consumers have undoubtedly experienced should be removed.

We understand the Tottenham District Council have called a special meeting to discuss what further action they shall take.

METER TESTING IN MANCHESTER.

Abolition of the Double Test.

The Manchester City Justices, at their quarterly meeting last Thursday, over which the Lord Mayor (Sir Alexander Porter) presided, further discussed the question as to whether the double or index test of gas-meters, as enforced by the Gas-Meter Testing Committee of the City Justices, or the single test, as advocated by the Gas Committee, should be adopted. Finally, the Justices resolved, by 19 votes to 16, to abandon the double test. This led to the resignation of five members of the Committee.

The LORD MAYOR said the Justices had obtained the opinion of Mr. Edgar Brierley, the Stipendiary Magistrate, upon the matter; and he had stated that the testing and stamping of indices was not expressly required by the Sales of Gas Act, 1859; that the Justices had power, if they thought fit, to require the testing and stamping of such indices; that the Gas Committee had no power to direct the Justices as to what tests should be made; and that, as an authority appointed to act impartially as between buyers and sellers of gas, it was the duty of the Justices to require such tests as should seem to them necessary.

Colonel CROOK moved that a resolution passed by the Justices on Oct. 29 last, that the double test be abolished, be rescinded. The double test, he submitted, was necessary in the interests of the small consumer.

Prof. BOYD DAWKINS seconded the motion. The Justices, he said, should be independent, and perfectly free from any interference whatever on the part of the Corporation. He suggested that the best way to get over the difficulty was for the resolution to be rescinded, and the whole matter referred to a new Committee.

Mr. J. H. SWAILES, who moved the resolution at the meeting of Oct. 29, did not acknowledge that there was any dispute or quarrel with the Corporation. He agreed with Mr. Brierley, who said in his opinion in regard to the double test that the "game was not worth the candle." Apart from the cost of the double test, he pointed out that it was not carried out anywhere else in the country.

Mr. JOHN WEST spoke strongly against the double test. They were now losing about £1100 a year in doing something which was unnecessary. Manchester was the laughing stock of the country in this matter.

The proposal of Colonel Crook was defeated, as already stated. The resolution of Oct. 29 therefore stands.

LEICESTER GAS OFFICIALS' SALARIES.

At a Meeting of the Leicester Town Council last Tuesday, a report was presented by the Gas Committee regarding suggested increases in salaries of several of the principal officials.

As to the Engineer and Manager of the Department (Mr. Hubert Pooley), they recalled the fact that he was appointed to the position in September, 1910, at a salary of £800 a year, to be increased by two annual increments of £100 each. Since his appointment his duties and responsibilities have very considerably increased, through the growth of the undertaking. The report proceeded: Mr. Pooley is a very efficient officer, and having regard to all the circumstances, to the assiduity with which he performs his duties, and to the eminently satisfactory manner in which he has managed the Corporation's extensive gas-works, they feel that the time has come when his remuneration should be placed on a more adequate basis. In 1891, the late Manager was in receipt of £1250 per annum, and the Committee advised that Mr. Pooley's salary should be raised from £1000 to £1250 per annum as from the 1st inst. They further recommended that the salaries of Mr. Fiddes (the Assistant Engineer), and Mr. Lovell (the Assistant Manager) be raised £100 a year each (from £400 to £500) as from Jan. 1, having regard to the excellent way in which they carry out their respective duties.

The report was not allowed to pass without slight opposition, Mr. Hilton, in moving its adoption in relation to the recommendation affecting the Engineer, pointed out that the supply of gas had increased by 250,000,000 c.ft. since Mr. Pooley's appointment, and that the undertaking had passed through the most critical period in its history in the last three years, with credit to the management and the department generally. The managers of similar undertakings usually received much larger salaries, with, for the most part, much less responsibility. They only asked that justice should be done to Mr. Pooley for the excellent services which he had rendered. He was now engaged upon a scheme which, if it should prove successful—as they believed it would do—would effect a considerable saving to the town. Mr. Carver seconded the adoption of the report, which was opposed by Mr. Riley, who said that he did not dispute Mr. Pooley's fitness for the office, but contended that an advance of £250 all at once was not justified. There had been complaints as to the deterioration of the quality of the gas, and the money increase imposed upon the consumers was not a fair representation of the actual increase.

The resolution in relation to the increase in Mr. Pooley's case was carried with two dissentients; the recommendations as to the Assistant Engineer and the Assistant Manager being afterwards unanimously agreed to.

LANCASTER GAS-WORKS DEVELOPMENT.

At the Lancaster Town Council meeting last Wednesday, Sir N. W. Helme, M.P. (the Chairman of the Gas Committee), referred to the satisfactory completion of work to provide a munitions factory with high-pressure gas plant and main at a cost of £4484, and dealing with a proposal to increase the salary of the Gas Engineer (Mr. Cecil Rhodes Armitage) from £350 to £450 per annum. He said the successful completion of the work to which he had alluded proved that Mr. Armitage was a capable Engineer. He had installed the water-gas plant and dealt with the laying of the high-pressure main, and the Gas Committee were practically unanimous in making this recommendation. When Mr. Armitage was appointed in 1913, the consumption of gas was 221 million c.ft. They were now supplying the projectile works with 100 million c.ft. per year. The production had increased 50 p.ct. Where they had such an increase, it was only reasonable to recognize the responsible official. Last year the profits enabled them to pay £12,409 to the reserve fund, apart from the contribution which was made to the rates in the usual way; and they were in the unique position of being able to produce gas cheaper than any other undertaking in the country, largely owing to good management. The next lowest in England was Widnes, where they were on the coalfield. So that, on the ground of economical management, he unhesitatingly asked them to adopt the recommendation. They had had a request from the projectile factory to immediately increase their production by an additional 100 million c.ft. per year.

In seconding, Mr. A. Hopkinson said it seemed to him that Mr. Cecil Armitage had proved so efficient that it was a question whether

it was desirable to continue the retainer to his father of £150 per annum as Consulting Engineer.

Sir N. W. Helme, M.P., said they had recently spent £26,753 on works extensions; and but for the ability of Mr. Cecil Armitage and his father, they would have had to pay about £1350 to a consulting gas engineer.

The proposal of the Committee was carried with a practically unanimous vote.

LEIGH (LANCS.) GAS-WORKS RESULTS.

Mr. F. Bowen, M.Sc., the Engineer and Manager of the Leigh (Lancs.) Corporation Gas-Works, in his second annual report to the Gas Committee (dealing with the year ended March 31 last year), says the gross profit for the year on the gas department is £12,830—being 6·91 p.ct. on the capital invested. This, after deducting sinking fund and interest charges, £11,263 (equal to 1s. 4·23d. per 1000 c.ft. of gas sold), leaves a profit of £1566. The profit is decreased owing to special charges having been met, leaving a net profit of £1080. The increasing burden of taxation which the country is called upon to bear is illustrated in a striking manner by the income-tax on the undertaking; this being £1420 in excess of the previous year, or 2d. per 1000 c.ft.

There was a satisfactory increase of gas made of 8,004,000 c.ft. over the previous year, despite the lessened output consequent on the Summer-Time Act and the further reduction of street lighting. This increased output is due to large requirements for munition purposes; these now amounting to 29,302,700 c.ft. Owing to this large consumption of low-priced gas, the average price came down during the year, and is now only 3·65d. per 1000 c.ft. over the pre-war year, notwithstanding the increase of 6d. in July, 1915. The full effect of the war-time price of coal has been met during the year, the average price being 2s. 7d. in excess of the previous year, or 6s. 2¼d. per ton over the pre-war year. The increased output was obtained at the expenditure of 443 tons of coal and 5039 gallons of oil less than the previous year, owing to the increased make of gas per ton—viz., 12,907 c.ft., as against 11,856 c.ft. The net cost of gas into the holder is 11·60d. per 1000 c.ft., compared with 11·93d. in the previous year.

The revenue from residuals was satisfactory in the aggregate. Good prices and a ready market were secured for coke; but the income from tar was lower, owing to the controlled prices of distillates. The revenue from sulphate promised well early in the year; but the prohibition of export and the fixing of home sale prices disappointed the hopes of a substantial increase in this source of income. Various schemes have been forthcoming for the partial compensation of sulphate makers; and at present a somewhat complex arrangement exists whereby the Sulphate of Ammonia Association apportion the profits of a limited export trade, and the Government contribute a quota of the transit charges on home sulphate. This has involved extra commercial work. Some consolation may, however, be derived from the reflection that much of this important fertilizer is sold in the immediate neighbourhood and results in larger crops.

The price of coal is governed by the Controller; and an increase of 2s. 6d. per ton was recently imposed. Labour bonuses are decided by arbitration; while the price of sulphate, vitriol, and the distillates of tar are controlled. There appears, therefore, small scope for ordinary commercial operations, while income-tax and interest on loans make increasing demands on the revenue. In face of these difficulties, the Committee have been reluctantly compelled to increase the price of gas by 3d. to ordinary consumers and 1½d. to prepayment consumers.

The total quantity of gas made was 181,690,000 c.ft., as against 173,686,000 c.ft.; and the proportion unaccounted for was 6·12 p.ct., compared with 7·02 p.ct. There were at the end of the twelve months 9774 consumers.

LOSS ON THE SIDMOUTH GAS-WORKS.

Application for Power to Increase the Maximum Price.

An inquiry was held at Sidmouth last Thursday, by Mr. R. G. MAXWELL, an Inspector of the Local Government Board, with reference to the Urban District Council's application for a Provisional Order authorizing them to increase the maximum price of gas. The Council acquired the works in 1913, and are restricted by their Act to a maximum price of 4s. 6d. per 1000 c.ft. Owing to war conditions, they have not been able to make the undertaking pay. They anticipated an increased sale of gas; and on taking over the works made extensions of the plant. But the consumption has decreased because of the lighting restrictions; and the hope of reducing the average cost of production has therefore not been realized.

Mr. P. MITCHELMORE (the Clerk to the Council) said that, for the year ending March last, the cost of production was 5s. per 1000 c.ft.; while the charge to consumers was for the first half of the year 4s. 3d., and for the second half 4s. 6d.

Mr. W. COOK, a ratepayer and lodging-house keeper, opposed the application, on the ground that the ratepayers generally ought to bear the loss on the gas-works, as they would have benefited if the undertaking had been a success. He had, however, no objection to consumers outside the Council's area being charged a higher price.

Mr. MITCHELMORE stated that the amount taken from the rates were: For 1916, £300; 1917, £500; and this year, £1000.

Mr. HALSE (the Chairman of the Council) pointed out that about one-third of the ratepayers are not gas consumers. But for the war, the consumption would have increased, and the cost would have been from 1s. 6d. to 2s. per 1000 c.ft. less than it is. The accumulated losses amounted to about £3000.

Major HASTINGS thought the Council should have asked for wider powers, as an increase of 6d. would not get them out of their difficulties.

The INSPECTOR said the Local Government Board would probably not go beyond the sum mentioned in the notice of inquiry; but if the Council passed an amending resolution asking for power to charge more than 5s., the Board might take the view that a further inquiry was not necessary.

FUEL ECONOMY IN COOKING APPLIANCES.

The second of the course of three public lectures—the first was noticed on p. 209 of last week's issue—on the "Principles of Fuel Economy in the Design and Use of Cooking Appliances" was delivered on Wednesday last, by Mr. A. H. Barker, B.A., B.Sc., at University College, London, W.C.

In the first place, the lecturer further considered the question of practical efficiency, and the causes of loss of efficiency. He pointed out that the efficiency of any process involving the combustion of fuel, either solid or gaseous, was limited by the fact that they could not directly utilize the heat of the waste gases that were at a temperature below that required for the operation being carried on. Unless, therefore, it was possible to employ gases below this temperature for secondary operations—such as warming water, gentle boiling, or keeping things warm, there was no alternative but to waste the heat. An ordinary cooking temperature might be put at 450° Fahr. There were few such operations which could not be performed at this or a lower temperature. The highest needed was 500°, or for certain baking processes 550°. They had to deal with a large volume of air containing a great deal of heat at a low temperature, as the principal cause of the waste of heat. If they rejected gases under 500°, they might reckon to have lost at least 20 p.ct. of the theoretical value of the fuel; the actual loss was much greater than this.

As to sources of waste, he said that, in connection with electrical power, there were, in addition to any other losses, those arising from the inefficiency of the engine generating the current. The best result up to the present in the transformation of the heat in fuel to mechanical power did not exceed at the outside limit 40 p.ct.; and the actual figure was usually no more than about 15 p.ct. It was important to remember that the maximum possible efficiency in the present state of knowledge was only 40 p.ct. of the fuel used. Comparing electricity with coal, it was found that of the total electrical energy supplied for cooking purposes a good deal less need be wasted than was the case with coal-firing. Electrical heat could be applied much more directly than fire heat. It might prove that this would more than compensate for the great loss of power. The actual efficiency of the ordinary coal-range was something below 3 p.ct.; and, further, the hot-water supply from it was often required during the whole day, while cooking was confined to a very few hours. If these ranges had been designed to waste fuel, it could hardly have been better done. All things considered, indeed, he thought 3 p.ct. efficiency was far too high to put the figure at. He quoted calculations to emphasize the great importance of minimizing by all possible means the waste of heat; remarking that unfortunately they had not learned to burn fuel in a proper manner, and to take care of the heat that was generated.

Coming to gas, Mr. Barker said great merits of this form of fuel were that it could be burned in the very smallest quantity, and that control could be maintained; while it did not contain soot. Its good points were, however, largely neutralized by two things—first, by the price charged, and, secondly, by the crude conception of the gas-cooker which had up to the present commended itself to the makers. The gas-oven was nothing more than a metal box, open at the bottom, and with a hole at the top. If the gas were burned with the minimum quantity of air, the temperature of the products of combustion would be such that the food would be destroyed; but the mixture of gas and air in the oven produced a temperature of manageable proportions to come in direct contact with the food. With gas burned with four times the necessary quantity of air, it would be about 1500° Fahr.; with six times, 1000°. In practice, the gas was mixed with eight or ten times the necessary air, so that the temperature was something over 500°, which was about right. This gave rise to a difficult problem. When the burners were turned down, there was no reduction in the amount of air allowed to go into the oven, though no doubt there was a reduction owing to the lower temperature. This, however, was not sufficient check; and therefore the efficiency was greatly lowered, which ought not to be the case. When the gas was turned down, the air supply should be reduced in the same proportion.

Proceeding, he pointed out that it must be remembered, in connection with any suggested improvements in gas-cooking apparatus, that it would not be possible for any undertaking to hire-out complicated appliances which would involve continual inspection and maintenance. They must be both simple and durable. Electrical energy was much more manageable, because it was not necessary to supply air for combustion. All that was needful was to provide a relatively cheap power supply. But as electrical cooking stood now, it was merely a "toy for the rich," instead of, as it ought to be, "the only power used by the poor." Anything in the way of electrical cooking apparatus should be made "fool-proof."

Dealing with the destruction of coal entailed in the delivery of 1000 B.Th.U. net to the food in the oven, the lecturer took the approximate efficiency of the ovens as: Coal, 3 p.ct.; gas, 11 p.ct.; and electricity, 21 p.ct. The figures he arrived at for the destruction of coal: Coal-fire, 2·37 lbs.; gas, 4·48 lbs.; and electricity, 1·74 lbs. It had, however, to be remembered that in the case of gas there were very valuable bye-products to be taken into account. It was not only possible, but probable, that at the present time gas cooking was very much more useful than electricity, because of the great value of the products. The whole question should, however, be exhaustively inquired into before a final conclusion was arrived at. His figures were only submitted as a basis for further investigation.

Taking 1000 heat units as about what one man required per day for a normal diet, and making calculations at various prices for coal, gas, and electric current, Mr. Barker gave figures the result of which, he pointed out, further bore out that the cost of electricity, as things were now, was enormously greater than that of coal or gas. Under

conditions which might be compared, gas was 1·8 times as costly as coal, and electricity was about three times the cost of gas. These figures might, of course, be modified by taking into consideration questions of convenience, &c. It was probable that the cost of gas relatively to coal would thus come down, and also electricity.

Turning to another matter, he told his audience that, in experiments, the same vessel was placed over two gas-rings—one small, and the other large. The efficiency of the small ring was very much the greater; reaching nearly 50 p.ct. With the large one it did not get up to more than 35 p.ct. Concluding, he said that the temperatures at which cooking was performed in this country were much too high; and this was an important matter to consider in connection with economy.

Questions and criticisms on points raised in the lecture having been invited, Mr. J. G. Clark said the difficulty had been mentioned that with coal there was practically no control over the air admitted to the combustion chamber. That was to say, the losses were almost entirely out of control. With gas one did have a certain amount of control. One could determine, in the first place, how much air was necessary to ensure proper combustion, and take steps to maintain this proportion throughout. He believed cookers varied somewhat in the proportion of air which was allowed; and it was his hope that very soon there would be some sort of standardization in regard to this matter. There must, of course, be a correct proportion, which need not be so very large. His own opinion was that it need not be more than three times the chemical requirements; and once it was determined, it could be kept under control with gas, which put it a tremendous way in advance of the use of raw coal. As to temperatures, with gas, there was a tap which was wonderful in its simplicity. There were innumerable positions to which it might be set, so that the consumption could be regulated to the most minute degree. With a little intelligence and sympathy on the part of the cook, economies could thus be effected which would limit the consumption to actual requirements, and at the same time conserve fuel which was so important to the nation.

GERMAN PRISONERS IN GAS-WORKS.

Protest from a Tribunal.

Before the Brighton Tribunal on Monday of last week, the Brighton and Hove General Gas Company had a large number of men on the list for revision—over 80 in all, comprising 32 "A" men, 13 "B1," 10 "B2," one "B3," 6 "C1," 14 "C2," and 12 "C." The Solicitor to the Company said he had been instructed to offer 16 men to the National Service Representative as being no longer required. All the men had protection cards; but it was thought they should go. Seven were "A" men.

Sir JOHN BLAKER (National Service Representative) asked if the Company had been discharging men recently.

The MANAGER replied that they had discharged 20 men from the Black Rock works.

Sir JOHN BLAKER: These men have been complaining that you might have discharged younger men rather than have thrown old men on the labour market.

The SOLICITOR said the reason was that the stove and fittings department had practically been closed-down; the men being released because of the shortage of work.

Sir JOHN BLAKER: Are you sure that none of these men could have taken higher places?

The MANAGER replied that this question had been threshed out, and they found that not one could have been put up.

Mr. GASTON (A Member of the Tribunal): When are you beginning German prisoner labour?

The SOLICITOR: Next Friday.

Sir JOHN BLAKER: I expect they will be well fed. It seems to me that if you want to be well fed now you must become a German prisoner.

Mr. GASTON did not think the people of Brighton would at all relish the idea of having Germans in their gas-works. It appeared to him a very serious matter, and he hoped notice would be taken of it.

It was then stated that some of the men would be employed on the land, and some in carting coal.

Alderman COLBOURNE: You get rid of British workers and then employ Germans. We would rather have the British remain, especially in a place like this.

Mr. JEFFS: Are these Germans going to be employed in place of the 16 men offered?

The MANAGER: We have undertaken not to.

Mr. JEFFS: And a very good job too, for your releasing men like this and then employing German labour is creating a very nasty feeling.

The CHAIRMAN (Alderman Sir John Otter): The point is are the men discharged capable of doing the work the Germans are to do?

The MANAGER: No. The work will be very hard, and the men discharged are of poor physique.

Sir JOHN BLAKER: With reference to the proposal for the release of the men for the Army, I say that you should not take older men when younger ones are available. Some of these men are very young, and yet they give old men away.

The Tribunal announced that the cases would be adjourned for further consideration.

The Doncaster Corporation, meeting in committee, are reported to have decided on a further 3s. per week war bonus to Corporation employees over 18 years of age, with certain exceptions, and 1s. 6d. to those under that age.

Reporting to the Heston and Isleworth Urban District Council, the General Purposes Committee say they are of opinion that it will be necessary, in the interests of the inhabitants of the district, to oppose the Brentford Gas Bill; and they therefore recommend that the seal of the Council be affixed to the petition against it.

GAS FOR MOTOR VEHICLES.

The first list of gas-filling stations for motor vehicles has now been issued by the British Commercial Gas Association, in conjunction with the Commercial Motor Users' Association, in the form of a booklet containing the addresses of over 1000 stations in all parts of the kingdom. The hours of business are included. This is, of course, a preliminary list. It is hoped to publish additional ones, giving particulars of further stations as they become available, and the whole question of coal gas for motor traction develops.

What is stated to have been the first prosecution of the kind took place at Newport (Mon.) last week, when George Weston (a chauffer) and John Duncan, of Cardiff, were charged with using gas for driving a motor-car to a meet of hounds. Weston was ordered to pay £2 and Duncan £10.

The deputation from the Commercial Motor Users' Association [*ante*, p. 212] has been informed that the Petrol Controller will concede any necessary increase in the monthly ration of petrol for commercial motor vehicles and public service vehicles which are equipped to run on gas.

During a recent week, the sales of gas for motor vehicles at the three filling-stations of the Leeds Corporation Gas Department amounted to 52,000 c.ft., independent of the quantity supplied through private meters. It is estimated that there are 150 cars in Leeds which have been converted to the use of gas. Dealing, in the pages of the "Motor Cycle," with the use of gas in petrol engines, Mr. Harold Moore says: The production of gas-works gas in the United Kingdom is about 200,000 million c.ft. per annum; while the quantity of gas generated in coke-ovens cannot be much short of this figure. A considerable proportion of the coke-oven gas is, however, used for heating the coking chambers, and would therefore have to be deducted in order to find the quantity available. The motor spirit imported into this country during 1914 was approximately 120 million gallons, which, together with shale spirit and benzol, would make roughly 150 million gallons of spirit available for motor use. This is equivalent to about 30,000 million c.ft. of gas, or 15 p.ct. of our coal-gas output. The production of this extra quantity of gas would undoubtedly necessitate an increase of plant; but it would be in no respects impossible to produce the extra amount, and thus completely supply the motor market. It has been suggested that the addition of acetylene to coal gas would increase its heat value. At the present time, there would be the greatest difficulty in obtaining either acetylene or calcium carbide in large quantities; and even if prices were to fall to pre-war standards, acetylene would still be too expensive for use as a motor fuel. It may also be remarked that it possesses a lower temperature of spontaneous ignition than coal gas, and would therefore reduce the maximum compression permissible. The comparatively high carbon and low hydrogen content of acetylene, together with its chemical structure, creates a danger of the deposition of carbon inside the engine if large percentages of this substance be employed. The heat value of acetylene is much greater per unit of volume than that of coal gas, 1 c.ft. yielding 1500 B.Th.U. net; and a similar amount of coal gas yielding only 500 B.Th.U. Gas could be available in sufficient quantity to replace petrol, and at about one-tenth the present price of this fuel.

AN AUSTRALIAN TAR PROBLEM.

In a minute presented to the Sydney Municipal Council, regarding the use of tar on city streets, the Lord Mayor stated that, in response to a request preferred by the Secretary of the Australian Gaslight Company, a conference had been arranged between representatives of the Company and the officers of the Council, with reference to complaints made that the quality of the tar was unsuitable for road purposes.

The Lord Mayor presided at the conference; and there were present, on behalf of the Company, Mr. R. J. Lukey (the Secretary) and Mr. Tindall (the Chemical Expert). The City Surveyor stated that there had been much difficulty with the tar. This was due, in his opinion, to the non-setting qualities of the dehydrated tar. The Council had been distilling the water and light oils from the Company's crude tar for the last fourteen years; and, until the past two years, it had generally been satisfactory. This tar was obtained from the Kent Street works, where horizontal retorts were in use. About two years ago, it was noticed that the quality of the tar received had changed somewhat, there being a higher percentage of light oils; and from inquiries made, it was ascertained that the cause of the change was attributable to a quantity of Mortlake tar having been brought to the Kent Street depôt and deposited in the same tank as the tar obtained from the Kent Street retorts. It was further stated that the proportion of Mortlake tar was continually growing, until a stage was reached when the whole of the tar was produced at Mortlake; and it was found that the percentage of oils removed had increased to the extent of 100 p.ct. beyond what it was a few years back.

For the Company, Mr. Tindall stated that, for the past two years, they had had several chemists engaged on the work of testing, and establishing a basis for supplying tars to meet the requirements of road work. He was satisfied that they had definitely ascertained the temperatures at which it was necessary to distil in order to obtain the various grades of tar necessary. The Company were following out the instructions of the War Precautions Act, as applied to the use of tar.

It was arranged that Mr. Tindall should collaborate with the City Surveyor on the matter; and it was anticipated that, as a result, there would be no renewal of the complaints.

Increased Consumption at Sleaford.—The past year witnessed a considerable increase in the consumption of gas at Sleaford—amounting to 16½ p.ct. At the forthcoming annual meeting, the Directors will recommend a dividend at the rate of 10 p.ct. per annum, free of income-tax.

COAL CARBONIZATION.

High-Temperature Systems and Modern Low-Temperature Processes.

In yesterday's issue of the "Financier" there appeared the fifth of a series of articles by the Editor (Mr. R. J. Barratt) dealing with "Coal and its Products." The previous articles pointed out that the carbonization of coal in this country began with the manufacture of gas. A second carbonizing process was that for the production of metallurgical coke for smelting purposes; while a third was that of the Mond and other producer gas plants. "All three of these are high-temperature systems; but a revolution in method has been achieved in the past ten years—namely, the destructive distillation of coal at low temperatures. By this means the partial dissipation that must occur when coal is carbonized at high temperatures is obviated; for every chemical constituent is recovered, and every ounce of energy conserved." The author proceeds to deal with

THE GAS-WORKS SYSTEM.

He says: The prime purpose here is the production of illuminating gas and, till the gas-tar industry came into being, the residues were thrown away. The gas-works method of carbonization can be made to yield from 10,000 to 12,000 or even 13,000 c.ft. of gas per ton, having a calorific value of 600 B.Th.U. per c.ft., from 8 to 12 gallons of tar, and from 20 to 25 lbs. of sulphate of ammonia, while about 60 p.ct. of hard coke remains. The following table, exhibiting the volume of illuminating gas obtainable from a ton of coal at various temperatures, shows why gas managers have hitherto favoured high-temperature carbonization, even if it involves waste in other important respects:

Temperature of Distillation.		Volume o. Illuminating Gas.	Tar.
°C.	°Fahr.	Cubic Ft.	Gallons.
1000	1832	12,500	8·5
900	1652	11,000	9
800	1472	10,000	12
700	1292	9,000	15
600	1112	7,750	18
500	932	6,400	21
400	752	5,000	23

THE COKE-OVENS PROCESS.

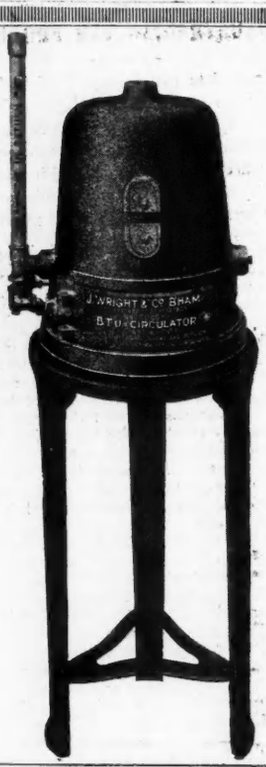
By the still higher temperature methods of the coke-ovens about 60 to 70 p.ct. of the weight of coal is converted into metallurgical coke. The bye-products include a high-grade gas, which can be used for lighting or steam-raising; tar equal in amount to that obtained by gas-works extractions; and sulphate of ammonia, the yield of which is (as in the case of the gas-works) from 20 to 25 lbs. per ton. The distillation of the tar is usually carried out by separate companies. It yields pitch, creosote, carbolic, light naphtha, benzol, dyes, and other products in small quantities. Unfortunately, the majority of the coke-ovens in this country are of so antiquated a type that the bye-products are not recovered, but wasted. In this respect we lag deplorably behind other countries (notably America and Germany), seeing that out of a total of 16,975 coke-ovens in the United Kingdom no fewer than 9210 are still of the non-recoverable beehive type. These beehive ovens, it is reckoned, consume about 7,000,000 tons of coal annually, which, if economically treated by modern plants, would effect a saving of £3,685,000.

THE PRODUCER-PLANT METHOD.

The third high-temperature process—that of the producer plants—yields power gas for heating, for generating steam under boilers, and for driving gas-engines. The volume of gas per ton of coal is enormous (about 150,000 c.ft.); but the calorific value is low—being about 140 to 160 B.Th.U. per cubic foot. The only bye-product of commercial value is sulphate of ammonia in large quantities. Indeed, the maximum ever obtained from the nitrogen in coal is got by this system; for, according to the nature of the coal gasified, the yield is from 80 to 140 lbs. per ton. On the other hand, the yield of tar is very small, and is of no value for distillation purposes, and no coke remains.

LOW-TEMPERATURE CARBONIZATION.

The aim of low-temperature carbonization, on the other hand, is to recover all, not some, of the constituents of coal, and, after distillation, to get a residue of smokeless fuel which, unlike the hard coke of the older processes, is actually superior to crude coal for domestic use. Over twenty years ago Col. Scott-Moncrieff tried to produce a smokeless fuel by subjecting the charge of coal in the gas-retort to only half the time of carbonization usually employed in the manufacture of coal gas, while maintaining the usual temperature. The product was, however, found to be coked on the outside and to be raw coal in the interior of the mass; and as it was impossible to obtain a uniform fuel, the project was dropped. The idea was revived later in a different form; and smokeless fuel was obtained by halving the temperature, not the time of carbonization, to which the charge of coal was subjected. The resulting product, known as "coalite," was then found to ignite in an ordinary grate without difficulty, to burn with a bright, cheerful flame, and at the same time to emit absolutely no smoke. . . Rival low-temperature systems are heard of from time to time; but the coailte process has stood the test of years, with progressive success and enormous potentialities. Mistakes were certainly made in the early days—as seems almost inevitable at the outset of a new industry; and it was unfortunate that the pioneers were not then in possession of drawings of the most modern appliances, which would have ensured better results than were at first obtained. One costly error was the use of iron instead of fire-brick retorts. But that was rectified; and as time went on various other modifications and improvements were effected. Now, thanks to an experience gained by the expenditure of nearly £1,000,000, which has involved the carbonization of 150,000 tons of coal from British and foreign mines, and the scrapping and



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re-erection of many plants, the standard of efficiency aimed at was attained.

ACTUAL ACHIEVEMENTS.

The works of the Barnsley Smokeless Fuel Company, which holds a licence to operate the coalite patents, are laid out for a plant having an eventual capacity for carbonizing 1000 tons of coal per day and upwards. At these works there are being produced:

(1) Gaseous fuel for use under boilers (and for gas-works), and which is being supplied to the power-station of the Yorkshire Electric Power Company, adjoining the Fuel Company's works.
(2) Oil fuel for maritime requirements, and light oils of the benzol series to replace petrol.
(3) Sulphate of ammonia for fertilizers.
(4) An ideal smokeless fuel for domestic use, and which can be used practically for almost all industrial purposes.

The recovery of ammonia is effected on what is known as the semi-direct process, which avoids excessive water condensation, and gives a yield of from 20 to 26 lbs. of sulphate of ammonia per ton of coal carbonized. A further quantity of the sulphate is recovered from the producer-gas plant, which is an essential part of the coalite process, as only producer gas of low temperature (flame ignition) is used for heating the low-temperature vertical ovens. Attached to the gas producer plant is an ammonia-recovery plant, and from all fuel passed through the producers from 60 to 80 lbs. of sulphate of ammonia per ton of coal gasified are recovered.

Contracts have been arranged for the erection of plants in different parts of the country for the carbonizing of about 10,000 tons of coal per day. These contracts are entirely in connection with electric undertakings; for the gas fuel derived from low-temperature carbonization can be sold to such undertakings at a price likely to effect a revolution in the cost of generating cheap electric power. The coalite interests are also now negotiating with gas companies on similar lines, for it is claimed that by the low-temperature carbonization of coal town gas can be supplied at a very much cheaper rate than at present exists on a pre-war basis of manufacture.

LOW-TEMPERATURE TARS.

The tars obtained by low-temperature carbonization are richer in light oils than recovery-plant or gas-works tars; the quantity obtained is double that yielded by the older methods; and its commercial value is also doubled—making a four-fold increase.

When coal tar is distilled up to 252° Fahr. benzol is obtained. By further distillation up to 306° Fahr., solvent and burning naphtha are driven out. Still further heating from 414° to 486° Fahr. results in the formation of creosote and other oils, referred to as the heavy oils. Beyond these are obtained anthracene oil and anthracene—both used to make dyes. Other products are lamp black, used in making printing ink, and pitch, for roofing, road making, and waterproofing.

The light, medium, and heavy oils given off in the process of distillation yield the first nine dye groups, such as benzol, toluol, xylol, and naphthalene. By addition and subtraction of various chemicals and by certain chemical changes these groups make up the three hundred dye "intermediates," such as phenol, aniline, cresol, &c. These, by further addition and subtraction, make the twelve hundred different coal-tar derivative dyes.

A CONFIDENT EXPECTATION.

Thus (the article concludes), as the Chairman of the British Coalite Company said at the recent annual meeting, smokeless fuel is only one of a vast number of products obtained from the low-temperature distillation of coal. Now that the eyes, not only of the country, but of the Government also, are centred on the vital necessity of conserving our coal measures by the adoption of more scientific and economical methods than have hitherto obtained, the ultimate result cannot be doubtful. The conclusions of the Fuel Research Board, he said, "are on precisely similar lines to those on which we are working, and the general lay-out of the research station which they recommended should be established was almost identical with the plant of the Barnsley Company. The recommendations of the Coal Conservation Sub-Committee transcend in importance those of the Fuel Research Board; for they advocate nothing less than the substitution throughout the whole of the country of gas fuel in place of crude coal for the production of electrical energy. For the full attainment of their ideal the distillation of coal at low temperatures is indispensable; and it does not need the prophet's eye to see that its coming is as inevitable as the rising of the sun."

REDUCED SUPPLY AND PRIORITY OF GAS.

The Citizens' Gas Company of Indianapolis found that during the cold weather in December the demand for gas reached 850,000 c.ft. per day—exceeding the total productive capacity of their plant by 350,000 c.ft., and were compelled to apply to the authorities for an order that would have the effect of reducing the consumption to manageable limits. The result was a mandate issued under authority of the Mayor of the City and the Chairman of the State Public Service Commission and the Federal Fuel Administration.

After reviewing the circumstances that have led to the present predicament, and the need for drastic action, as if the supply is entirely exhausted from the mains the district will be without gas for thirty days or more, the order sets forth that the first obligation of the Company is the domestic users, who should have preference under conditions that would prevent any abuse of the privilege, and the next is the manufacturers, many of whom cannot conduct their operations in the absence of a supply of gas. The Government have already indicated that in the supply of coal the small user must have first consideration; thus furnishing a precedent for a Priority Order as follows: (1) Cooking, (2) lighting, (3) domestic water heating, (4) warming apartments

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"ORIGINAL."

TYPES. Supplied in 4 distinct types with component parts interchangeable.
HYGIENE & VENTILATION perfect. BURNERS are reversible at will.
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WORKS: Gothic Works, **EDMONTON, N. 18**; Gothic Ironworks, **FALKIRK**; and Gothic Works, **BIRMINGHAM.**
SHOWROOMS AND BRANCHES: 25, PRINCES STREET, OXFORD CIRCUS, W. 1; 82, Gordon Street, **GLASGOW**; 18, Severn Street, Deansgate, **MANCHESTER**; 97, Millfield, **BELFAST**; 333, Queen Street, **MELBOURNE**; and 12, Cunningham Lane, Pitt Street, **SYDNEY, N.S.W.**

for which no other appliances exist, and where the gas was used for this purpose in 1916, (5) industrial uses to the extent of the gas consumption for such purposes in the corresponding months of 1916. All outside private lights are to be discontinued, and the public lighting reduced one-half. These conditions being conformed to, any surplus can be supplied without restriction. The Company are to inspect all premises where gas is in use, to cut off and seal the connections of all appliances that do not come under the specified limits; to prohibit the use of cooking, lighting, or industrial appliances for warming; and to warn customers against violation of the order. In the event of non-compliance, the supply of gas will at once be cut off outside the premises. The citizens are called upon to co-operate to the fullest extent in securing faithful observance of these conditions, and the avoidance of a total cessation of the gas supply.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 4.

The London tar products market remains quiet, most of the products being under official control. Shipments of pitch against contract are being regularly made; and the value of this article at present is reported to be over 50s. net per ton f.o.b. Makers are also receiving inquiries for tar for road purposes; but some uncertainty reigns whether it will be permissible to use tar for this purpose during the coming season, in view of the Government requirements of the products of distillation. Other prices are: Solvent naphtha 4s. 3d. to 4s. 6d. net per gallon in bulk, and anthracene, "A" quality, 6d. net per unit per cwt., packages free, both *ex* makers' works.

Tar Products in the Provinces.

Feb. 4.

The average values for gas-works products during the week are: Gas-works coal tar, 27s. 6d. to 31s. 6d. Pitch, East Coast 20s. to 25s. per ton; West Coast—Manchester 18s. 6d. to 19s. 6d., Liverpool 19s. 6d. to 20s. 6d. Clyde 19s. 6d. to 20s. 6d., nominal. Benzol 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7⅞d. to 8¼d. Solvent naphtha, naked, North, 3s. 10d. to 4s. Heavy naphtha, North, 2s. 3d. to 2s. 6d. Creosote, in bulk, North 4d. to 4¼d. Heavy oils, in bulk, North 4¼d. to 4½d. Carbolic acid, 60 p.ct. East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Conditions remain about the same, although in one or two directions there is a tendency for quotations to advance. This is the case with pitch, which has improved a further 6d. a ton. Even in Manchester, in spite of the accumulation which is going on there, the price has reached 22s. per ton. In other districts, stocks are not exceptional, and the consumption of the product is practically up to output. Shipping facilities have been rather better, and some good transactions are reported from the North-East Coast; while London quotations remain at from 48s. to 50s. per ton. Naphthas are in good demand; and little difficulty is experienced in obtaining licences. Quotations are, if anything, a shade firmer, with a tendency to advance to a higher level. A higher price could easily be obtained for solvent; but the larger and older makers are discouraging any efforts in this direction, in order to avoid any further official interference with the trade. Naphthalenes are becoming more difficult to obtain. The demand for crudes is exceptionally keen and, so far as lower grades are concerned, in excess of the supply. The price for these is about £7 10s. per ton; better qualities make up to £15 per ton; and refined readily sells at £32 10s. to £35 per ton. In all probability the Government will shortly assume control of these products if any further advance occurs. Cresylic acid is very firm, and supplies are somewhat restricted. Official requirements absorb all the creosote produced. There is no change in anthracene and aniline oil; while benzol, toluol, and carbolic acid are quite nominal. The range of quotations is as follows:

Aniline Oil (pure): 1s. 2d. per lb.

Benzol: 90% London, 1s. 0¾d., North 10¾d. to 11¾d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40% 1s. 3d. per lb.

Crude Tar: London 32s. to 35s., Midlands 26s. to 28s.; North 27s. to 28s. 6d. per ton, *ex* works.

Pitch: London 48s. to 50s. f.o.b.; East Coast, 22s. to 24s. f.o.b.; West Coast—Liverpool 22s.; Manchester 22s. to 23s. f.a.s.; Clyde 22s. to 24s.

Solvent Naphtha: Naked London 90-190% 3s. to 3s. 3d.; North 2s. 9d. to 3s. per gallon; 90-160% naked London 4s. 3d. to 4s. 6d.; North 4s. to 4s. 3d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6¼d. to 6½d.

Naphthalene: Refined £32 10s. to £35; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 3¾d.; heavy oil, 4¼d. per gallon in bulk.

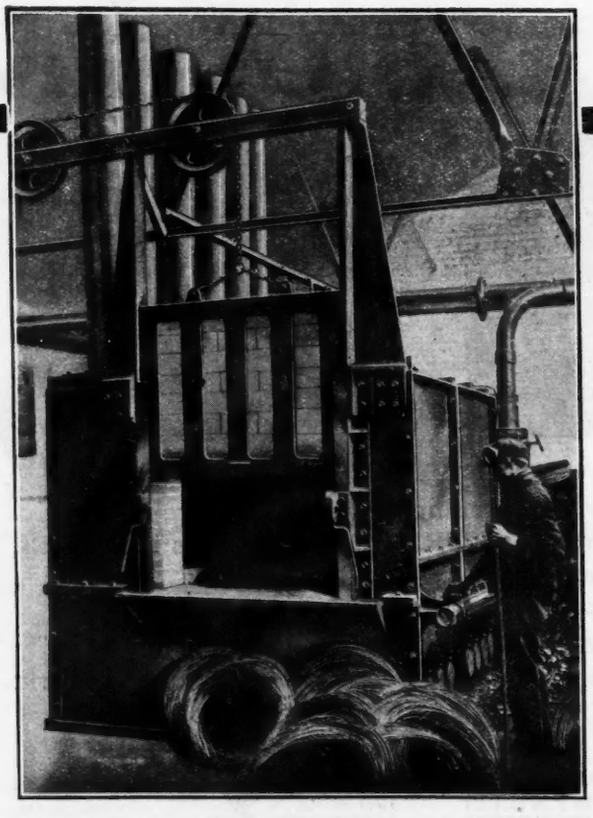
Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 2s. 9d. to 2s. 10d. per gallon; 97-99%, 3s. per gallon, *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

Beyond a further increase of orders for home uses, there is very little to report. Makers are producing to capacity; and, according to present plans, an increasing amount of concentrated liquor will be



Whatever heat-treating proposition is under consideration, there is a "Richmond" Furnace to suit the class of work.

2,000 Gas Furnaces

Illustration shows one of over 2,000 "Richmond" Furnaces employed on War Work in one large Industrial Centre. This particular installation consists of a large "L.P.G.A." Furnace for annealing wire; each coil weighs (approx.) 1 cwt., and the Furnace takes a charge of several tons.

The many advantages of Gaseous heating, combined with the efficiency of "Richmond" Furnaces, presents a convincing argument with which to approach Manufacturers in your district, and our Furnace Staff is at your disposal to co-operate on any heat-treating proposition.

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made this year. Even so, there is going to be a tight squeeze to supply the agricultural demand, in view of the increased area to be cultivated; and exports, apart from the small quantities arranged by the Government on special grounds, are out of the question—at any rate, until agricultural requirements are more definitely known. Reports are current of a new process for producing sulphate of the uniform quality of 25 p.ct. It is claimed for this process that the condition of the fertilizer is improved, in that its action upon crops is better. Sulphate here, of course, varies from 24 to 25 p.ct.; the maximum prices being for an average of these qualities—viz., 24½ p.ct. Murmurings are still heard that the maximum prices are not high enough; but the trouble appears to be how the Government can arrange better terms without upsetting the farmer, who is the last person the Government can afford to offend in present circumstances.

Sinking-Fund Suspension Question in Scotland.

At the meeting last week of the Annual Committee of the Convention of Royal Burghs, there was discussed a memorandum on the proposed suspension of the sinking-fund provisions and the strengthening of the rating and borrowing provisions of the Burghs Gas Supply (Scotland) Act, 1876. It was stated in the report that there were in Scotland approximately 250 gas undertakings. Of these, about 60 were in the hands of private companies or private owners. Arising out of the war conditions, there was the increasing difficulty experienced by certain local authorities in renewing loans falling due and obtaining fresh money to repay them, and then only at largely increased rates of interest. This fact, combined with the deficiences in revenue accounts, magnified the difficulties of undertakings thus placed so as to become almost insurmountable. Among the proposals submitted was one that, where the circumstances warranted, powers be given to corporation gas authorities to suspend the operation of the sinking-fund provisions for the duration of the war, and for at least one complete financial year thereafter; and where this is done, a gas contingent guarantee fund shall, if necessary, be imposed. Mr. James Burns (Town Clerk of Motherwell), seconded by Mr. A. Morrison (Town Clerk of Bridge of Allan), moved approval. Provost Cochrane (Prestwick), who moved disapproval of the proposal to suspend the operation of the sinking fund, said he saw no reason for differentiating between a gas undertaking and any other commercial concern. If the cost of production had gone up, the obvious plan was to ask the consumer to meet the increased cost. The recommendations were approved by a large majority; and it was agreed that a deputation should wait upon the Secretary for Scotland.

Edinburgh Gas Sales Increase.—At the last meeting of the Edinburgh and Leith Gas Commissioners, the Treasurer (Mr. A. Canning Williams) reported a large increase in the sale of gas during the six months ended Oct.-Nov.—viz., 59,000,000 c.ft., or 8·29 p.ct. The money value of this increase is £9980.

The Sale of Coal.

In the form of a lengthy document, there have now been issued the revised directions as to the Sale of Coal to which reference was made by the Coal Controller last October. The main alteration is in regard to shipments to Norway, Sweden, Denmark, Holland, and Spain. All quotations for sales to these countries are in future to be made in the currency of the country in question; and payment is to be made by the buyer in the same currency through accredited agents of the British Government in the various countries. The increase of 2s. 6d. per ton as from Oct. 15, 1917, applies to all consignments dispatched for shipment (otherwise than to France or Italy) on or after that date, including deliveries under all existing contracts. As to sales for consumption in the United Kingdom and the Channel Islands, no coal may, without the consent of the Controller of Coal Mines, be sold by collieries for consumption in the United Kingdom, except at the maximum prices chargeable under the Price of Coal (Limitation) Act, and the Coal (Pit's Mouth) Prices Order, 1917, provided that in any case in which the maximum price chargeable by a colliery for a particular class of coal for consumption in the United Kingdom is higher than the price specified in Schedule A appended to the directions, the colliery may charge for such coal for inland consumption prices lower than the said maximum, but in no such case (whether sold in truck at pit or f.o.b.) less than the price specified in the schedule. Prices of coal for consumption in the Channel Islands shall be determined as in the case of sales of coal for consumption in the United Kingdom.

Price of Gas at West Bromwich.—The West Bromwich Town Council have found it necessary, in consequence of the higher productive cost, to further increase the price of gas to all consumers by 3d. per 1000 c.ft. as from Jan. 1.

Irish Gas Prices.—The Londonderry Gas Company have increased the price of gas from 4s. 9d. to 5s. per 1000 c.ft. When the bill of the Lismore Gas Company came before the local Poor Law Guardians, the price was stated at 7s. 11d. per 1000 c.ft. Mr. O'Donnell said Lismore was the dearest town in Ireland in respect of gas supply price; and he thought the Guardians should give a lead to the townspeople by refusing to pay an enhanced rate. It was agreed, however, to discharge the account.

Tottenham District Light, Heat, and Power Company.—The Directors recommend the payment of dividends in respect of the half year ended Dec. 31 last at the rate of 5 p.ct. per annum on the preference stock, 5½ p.ct. per annum on the "A" stock, and 4 p.ct. per annum on the "B" stock. The dividends for the corresponding period were at the rate of 5 p.ct. per annum on the preference stock, 5 p.ct. per annum on the "A" stock, and 3½ p.ct. per annum on the "B" stock. The amount carried forward is £4941, as against £4466 brought in.

WAR ECONOMY.

MINIMISE WASTE by INCREASED CONTROL.

Pressure and Vacuum Recorders and Indicators.

Unexcelled by any on the market. **BRITISH MADE and ACCURATE**

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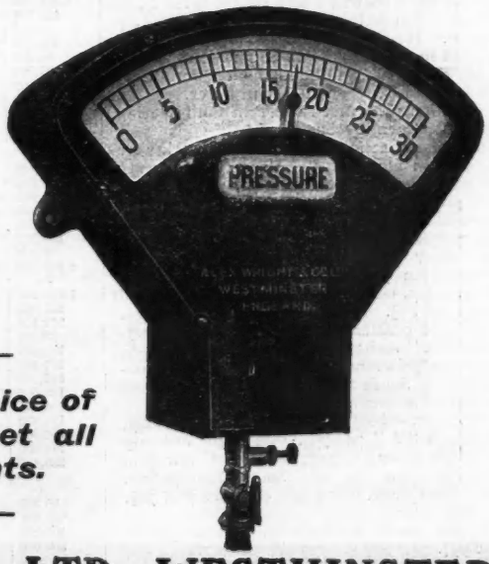

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ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Discharged Soldiers for Gas-Works.—In a report to the Chelmsford Corporation, the Gas Manager (Mr. E. W. Smith) states that there is some prospect of the shortage of labour, which has been felt most acutely at the gas-works, being relieved somewhat, as he has recently received an offer from the Labour Department of the Ministry of Munitions of a few discharged soldiers for gas work. He has asked for a sufficient number to meet present needs, and expects to get these men within a few days. He has also, at last, been successful in obtaining the release of one of the former stokers from the army; and he is now back at work.

Edinburgh Gas-Workers' Wages.—The Edinburgh and Leith Gas Commissioners have recently received two further requests from the Edinburgh Branch of the National Union of Corporation Workers. The first deals with the conversion of war bonus into war wages, and refers to the fact that in certain trades war wages are now adopted instead of war bonus. The Union therefore ask that war wages be given where the Commissioners have men of these trades, in accordance with the agreement. In their second request, the Union mention that women munition workers of 18 years and over have now been granted 3s. 6d. per week increase; and the Union are of opinion that the advance should be extended to such women in the employ of the Commissioners at Granton.

West Bromwich Gas-Works.—A Committee of the West Bromwich Town Council recommend that the salary of Mr. W. H. Johns (Gas Engineer and Manager) be increased from £550 to £600 per annum, to take effect from Nov. 1. They report that, as a result of an application from the Gas and General Workers' Union, they have granted an additional 5s. per full ordinary week to men of 18 years of age and over, and 2s. 6d. per week to boys, youths, and apprentices under that age, with 2s. 6d. more upon attaining 18 years.

Bradford Gas Workers Prefer Settlement.—In regard to a recent confirmation by the Bradford Corporation of the War Wages Committee's recommendation of advances of war bonus from 12s. to 16s. per week for men, 6s. to 9s. for women, and 6s. to 8s. for youths, to date from Oct. 1 last—despite the rejection of the offer by the majority of the employees, and a demand for arbitration—the War Wages Committee, last week, took a ballot of all the employees concerned (numbering between 4000 and 5000) on the question of the acceptance of the offer or arbitration. This course was prompted by the gas workers having stated their wish to accept the offer. The remainder of the employees' unions strongly objected to the ballot, and a considerable controversy has arisen as to its propriety; the gas workers actively supporting the attitude of the War Wages Committee in the matter.

STOCK MARKET REPORT.

THERE is not a single new feature to note in reviewing the state of things on the Stock Exchange last week. Dead-quiet, approaching stagnation, ruled throughout; and sombre dulness oppressed pretty well every market alike, as if the atmospheric fogs without had got into them. The best that can be said is that the closing day was the least gloomy. War operations, save on a minor scale, seemed to be suspended for civil strife; and strikes in "Mittel-Europa," and threats of strikes at home, engrossed current interest. Certainly the times did not appear conducive to speculative enterprise.

The gilt-edged market was flat. In Home Government issues, the War Loans and Consols had a further fall, contending not only with National Bonds, but with a big Colonial Loan. Home Rails quietly sagged down without a helping hand to stay them. Americans and Canadians were irregular, and Argentines were unsettled by labour uncertainties.

The Foreign Market was variably affected. The most noteworthy point was a disposition to regard Russians more hopefully, so that they were fairly supported at the close. French and Japanese were pretty firm, and Brazilians were helped up by improved exchange. The miscellaneous group was lacking in interest. Rubber continued a dull market; but Oil was in pretty good demand. Breweries reacted, and were subjected to a good bit of realizing. Shipping was fairly steady. Of the rest, Iron and Steel and Textiles were the steadiest.

In the Gas Market the pendulum took a swing the wrong way; and the volume of business showed a marked reduction below the level of the week before, though perhaps it was no more than commensurate with the slackness of markets in general. Movements were irregular; but they were of small magnitude in either direction. All Gas Light and Coke issues that were dealt in showed a turn for the better; and the quotation of the ordinary stock was put up a point. Hastings and St. Leonards and Ilford touched higher prices, and South Metropolitan, South Suburban, and Southampton were firm; but Brentfords were put a point lower.

The Money Market ruled firm until nearing the close, when it relaxed.

Bargains done for cash during the week were as follows: On Monday, Aldershot preference 60, 60¼, Gas Light ordinary 70, 70⅛, 71, 71⅛, ditto preference 71¼, ditto debenture 56½, Hastings and St. Leonards 5 p.ct. 70, ditto 3½ p.ct. 51½, 52, Metropolitan of Melbourne debenture 100, River Plate debenture 59, 59½, South Metropolitan 75⅝, 76¼, South Suburban 76½. On Tuesday, Gas Light ordinary 71, Richmond 5 p.ct. 80, 80½. On Wednesday, European 9¼, Gas Light ordinary 70¼, ditto preference 71½, Ilford "A" and "C" 94¼, Monte Video 8 1/16, Primitiva preference 56s. 9d., San Paulo preference 7⅞, South Suburban 75⅝, Southampton 76, 76½, Wandsworth 3 p.ct. debenture 50⅜, 51, ditto 4 p.ct. debenture 65, 65½. On Thursday, Brentford "A" 79, 79½, Gas Light ordinary 70¾, ditto debenture 57⅜, Imperial Continental 89¾, Primitiva 36s. 9d., South Metropolitan 76½. On Friday, Gas Light ordinary 70½, 70⅜, 71, 71¼, ditto debenture 57¾, Primitiva preference 55s., South Metropolitan 76, ditto preference 93¾.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	57—62	60—60½
1,551,868	,,	April 8	9½	4¾%	Alliance & Dublin Ord.	59—64	52—57	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	5<—63	..
380,000	5	April 29	7⅛	3/6	Bombay, Ltd.	5⅞—6⅜	5 - 5½	..
50,000	10	Feb. 26	16	14%	Bourne- 10 p.c.	29—30	23—25	..
883,110	10	,,	7	7%	mouth Gas B 7 p.c.	15—15½	10½—11	..
115,000	10	,,	6	6/-	and Water Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	4 p.c. Deb.	..	67—69	..
992,045	Stk.	Feb. 26	14	5½%	Brentford A Consolid.	261—266	78—81	79—79½
734,220	,,	,,	11	4¼%	Do. B New	204—209	75—78	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	81—86	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	63—65	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	145—150	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	98—103	..
530,000	20	Mar. 26	12½	22/6	British	44—45	32—33	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	51—54	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	3—3½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	6½—7½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,513,280	,,	Feb. 19	5/9/4	4½/-	Commercial 4 p.c. Stk.	106—108	70—72	..
560 000	,,	,,	5½	40/-	Do. 3½ p.c. do.	103—105	64—66	..
475,000	,,	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	61—63	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	165—175	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	9—10*	9½
16,298,975	Stk.	Feb. 10	4/17/4	97/4	Gas 4 p.c. Ord.	98—102	70—72	70—71½
2,800,000	,,	,,	3½	3½%	Light 3½ p.c. max.	76—79	56—58	..
4,062,235	,,	,,	4	4%	and 4 p.c. Con. Pref.	96—99	70—72	71½—71½
4,674,850	,,	June 11	8	8%	Coke 3 p.c. Con. Deb.	72½—74½	55—57	56½—57¾
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
258,740	,,	Mar. 12	5	3⅛%	Hastings & St. L. 3½ p.c.	87—89	48—53	51½—52
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16½	7½—8½	..
86,600	—	—	—	9%	Hornsey 7 p.c.	..	115—125	..
181,000	Stk.	Mar. 12	7½	7%	Ilford A and C.	151—154	92—97	94½
65,780	,,	,,	6¾	5¼%	Do. B	115—118	72—77	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	63—66	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	88—91	89¾
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—213	82—84	..
					B	146—148		
906,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3⅝—3¾	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—100	100
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8—8½	8 1/16
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	96½—99½	76—77	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	60—62	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c.	14—15	9½—10½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	102—104	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅞—7⅞	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B	128—131	83—88	..
100,000	50	,,	12	11%	Do. C	118—121	72—78	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅞—2	56/9
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4½—5	2⅜—3	55/—56/9
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	76—78	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	57—62	59—59½
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	7⅛—8	7⅞
125,000	50	July 1	5	5%	5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	222—224	180—184	..
523,500	,,	,,	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African.	10½—11½	9—10	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	75—77	75½—76½
—	—	—	—	—	Do. Pref.	..	92—94	93¾
1,895,445	,,	July 10	8	8%	Do. 3 p.c. Deb.	72½—74½	54—56	..
224,820	,,	Feb. 26	8¼	7½%	South Shields Con. Stk.	157—159	137—139	..
952,795	,,	,,	6	4⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	75—77	75¾—76½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	75—77	..
135,000	—	—	—	4½%	Do. West Kent	..	..	..
167,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	84—86	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	75—77	76—76½
120,000	,,	Feb. 12	7½	5½%	Tottenham A 5 p.c.	135—138	92—97	..
782,275	,,	,,	6	4%	District B 3½ p.c.	115—117	70—72	..
181,255	,,	June 26	4	4%	4 p.c. Deb.	87—89	61—63	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8¾	72/6	Wandsworth A 5 p.c.	151—156	112—117	..
255,636	,,	,,	6¾	57/6	Do. B 3½ p.c.	129—134	97—99	..
108,075	,,	,,	5/17/8	50/9	Do. C 3½ p.c.	110—115	84—89	..
262,000	,,	,,	6¾	51/8	Wimbledon 5 p.c.	117—122	85—90	..
98,000	,,	,,	6¾	57/6	Epsom 5 p.c.	121—126	93—98	..
88,416	,,	June 26	8	8%	3 p.c. Deb. Stk.	66—69	49—52	50½—51

* Ex Div.

Metropolitan Boroughs and Financial Hardships.—At the annual meeting of the Metropolitan Boroughs Standing Joint Committee, it was decided to make representation to the Board of Trade urging that Department to strenuously resist the proposals of gas companies to secure relief from the financial hardships devolving upon such undertakings by reason of the war.

Alliance and Dublin Gas Bill.—The correspondence on the agenda of the Dublin Corporation for their meeting this week includes a letter from the Dublin Trades Council forwarding a resolution calling on the Corporation to oppose the Alliance and Dublin Consumers' Gas Company's Bill unless the Company agree to give a share in the control of the Company and its undertaking to the Corporation.

South Metropolitan and South Suburban Gas Bills.—The Finance Committee of the Camberwell Borough Council have considered the Bills of the South Metropolitan and South Suburban Gas Companies, and report that before proceeding in the matter, they thought it advisable to give the South Metropolitan Gas Company an opportunity of conferring on the proposals contained in the Bill, and invited them to send a representative for this purpose. Mr. F. M'Leod (the Secretary) attended, and explained the reasons which, in the opinion of the Company, necessitated the increase in the price of gas, and the alteration of the existing sliding-scale, as well as other details in regard to the finances of the Company, the price of labour and material, the production and sale of bye-products, &c. In view of the facts submitted, they are of opinion that the Council should not oppose the Bills in the House of Commons; but, should the necessity arise, they can be opposed when they are before the House of Lords.

The Slaithwaite Urban District Council, in support of the decision of a recent meeting of several councils of the district, last week decided to oppose the Longwood and Slaithwaite Gas Company's Bill, which seeks to vary the dividend during the war and for two years afterwards.

Reporting on the British Westinghouse Employees' War Relief Fund, the Executive state that the number of employees who have joined the forces up to date is 3100; and they much regret that the casualties are exceedingly high. The number of families in receipt of weekly relief is 757. From a statement of receipts and payments from August, 1914, to December last, it is seen that of the total sum contributed, amounting to £50,008, £33,417 has been given by the employees, and £16,591 by the Company.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral Countries unless they are posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 30.]

Nos. 1139—1569.

AUSTIN, F. T.—"Collapsible gas-bags for motor vehicles." No. 1375.

BÄCKSTRÖM, H. M.—"Method of fixation of nitrogen for producing ammonia or ammonium salts, &c." No. 1558.

BÄCKSTRÖM, H. M.—"Process of producing ammonia." Nos. 1558, 1559, 1560.

BAKER, H.—"Recovery of ammonium chloride from ammoniacal liquor with the extraction of cyanides, &c." No. 1211.

BARCLAY, S. F.—"Means for filtering gases." No. 1495.

BROWN & BARLOW.—"Apparatus for measuring flow of liquids." No. 1433.

CALVERT, G.—"Production of cyanide and cyanogen compounds." No. 1248

CEDERBERG, I. W.—See Bäckström. No. 1558, 1559, 1560.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAS.—"Manufacture of producer gas." No. 1159.

CRADDOCK, J. C. B.—"Control device for gas-cookers." No. 1538.

FREW, H. A. G.—"Gas fire-lighters." No. 1228.

HIGGINS, W.—"Vaporizers for internal-combustion engines, applicable in the manufacture of gas and distillation of hydrocarbons." No. 1343.

HIGGINS, W.—"Gas-containers." No. 1346.

HOPE, H. G. & R.—"Compressed coal-gas automatic governor." No. 1287.

KYHLBERGER, G. A.—See Bäckström. Nos. 1558, 1559, 1560.

LITWIN, P.—"Coke-furnace for gas-generator." No. 1166.

LLOYD, J.—"Recovery of solvents and volatile liquids." No. 1500.

MASCORD, G. W.—See Higgins. No. 1343.

NIELSEN, H.—"Photometers." No. 1473.

PEASE, E. L.—"Extraction of nitrogen from gases, and its conversion into nitrogen compounds." No. 1418.

PIETERS, J.—"Charging-apparatus for distilling-apparatus." No. 1272.

PIETERS, J.—"Apparatus for discharging coke, &c." No. 1273.

PIETERS, J.—"Coke-ovens, &c." No. 1274.

WAITE, J. N.—"Apparatus for obtaining gas from combustible materials." No. 1257.

WILD, J. H.—See Lloyd. No. 1500.

Intimation is made by Messrs. John Terry and Co. (acting as Agents for the Company) that the Metropolitan Gas Company of Melbourne cable that their profits for the half year to Dec. 31 last were £86,025. A dividend of 6s. 6d. per share has been declared for the half year; a sum of £18,000 has been transferred to the reserve fund; and a balance of £66,316 is carried forward. Dividend drafts to absentee shareholders will be posted by the first mail after the 1st inst.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

WORKS MANAGER AND CHEMICAL ENGINEER. No. 6411.

CHEMIST. Sheffield Gas Company.

CHEMIST. Hartlepool Gas and Water Company. Applications by Feb. 8.

CLERK (Male or Female). Bridlington Gas-Works.

GAS MAKER. N. H. Humphrys, Salisbury.

MAIN AND SERVICE LAYER. Scarborough Gas Company.

FITTER AND PLUMBER. Castletown Gas-Works.

GAS-FITTERS. Scarborough Gas Company.

STOKERS. Gravesend Gas-Works.

Appointment Wanted.

WORKS MANAGER OR MANAGER AND SECRETARY. No. 6389.

Plant, &c., for Sale.

RETORTS, &c. Newcastle Gas Company.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER. No. 6410.

Meeting.

HORNSEY GAS COMPANY. No. 5, Great Winchester Street, E.C. Feb. 22. 3.30 o'clock.

TENDERS FOR

Coal.
MILFORD HAVEN URBAN DISTRICT COUNCIL. Tenders by Feb. 9.

Coke.
ASCOT GAS-WORKS.

Coke Skips.
WARRINGTON GAS COMMITTEE.

Purifier Grids.
WARRINGTON GAS COMMITTEE.

Purifying Material.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Feb. 11.

Sulphuric Acid.
FORMBY GAS COMPANY.

Tar and Liquor.
FORMBY GAS COMPANY.
MANCHESTER GAS DEPARTMENT. Tenders by March 21

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See Illustrated Advertisement, Nov. 27, p. 437.

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CALCULATORS OF GAS CHARGES.—In view of the interest evinced by Gas Undertakings in this Device—which was noticed in the "JOURNAL" for Dec. 4 last, p. 485—Mr. H. GOODFELLOW, of 57, BRIXTON HILL, LONDON, S.W. 2, will be pleased to supply copies (copyright) at 5s. each, post free.

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